Nos. 2022-1477, -1478, -1479, 1480

UNITED STATES COURT OF APPEALS
FOR THE FEDERAL CIRCUIT

VEDERI, LLC,

Appellant,

v.

GOOGLE LLC,

Cross-Appellant.

Appeals from the United States Patent and Trademark Office, Patent Trial and Appeal Board In Inter Partes Reexamination Nos. 95/000,681, -682, -683, -684

APPELLANT VEDERI, LLC'S OPENING BRIEF

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UNITED STATES COURT OF APPEALS FOR THE FEDERAL CIRCUIT

CERTIFICATE OF INTEREST

Case Number 22-1477, 22-1478, 22-1479, 22-1480

Short Case Caption Vederi LLC v. Google LLC

Filing Party/Entity Vederi LLC

Instructions: Complete each section of the form. In answering items 2 and 3, be specific as to which represented entities the answers apply; lack of specificity may result in non-compliance. **Please enter only one item per box; attach additional pages as needed and check the relevant box**. Counsel must immediately file an amended Certificate of Interest if information changes. Fed. Cir. R. 47.4(b).

I certify the following information and any attached sheets are accurate and complete to the best of my knowledge.

Date: 08/01/2022

Signature: /s/ Shaun P. Lee

Name: Shaun P. Lee

1. Represented Entities. Fed. Cir. R. 47.4(a)(1).	**2. Real Party in Interest.** Fed. Cir. R. 47.4(a)(2).	**3. Parent Corporations and Stockholders.** Fed. Cir. R. 47.4(a)(3).
Provide the full names of all entities represented by undersigned counsel in this case.	Provide the full names of all real parties in interest for the entities. Do not list the real parties if they are the same as the entities. ☑ None/Not Applicable	Provide the full names of all parent corporations for the entities and all publicly held companies that own 10% or more stock in the entities. ☑ None/Not Applicable
Vederi LLC		

☐ Additional pages attached

4. Legal Representatives. List all law firms, partners, and associates that (a) appeared for the entities in the originating court or agency or (b) are expected to appear in this court for the entities. Do not include those who have already entered an appearance in this court. Fed. Cir. R. 47.4(a)(4).

☐ None/Not Applicable ☐ Additional pages attached

Lewis Roca Rothgerber Christie LLP (formerly Christie, Parker & Hale LLP)		
Robert Green		

5. Related Cases. Provide the case titles and numbers of any case known to be pending in this court or any other court or agency that will directly affect or be directly affected by this court's decision in the pending appeal. Do not include the originating case number(s) for this case. Fed. Cir. R. 47.4(a)(5). See also Fed. Cir. R. 47.5(b).

☐ None/Not Applicable ☐ Additional pages attached

Vederi LLC v. Google LLC, Central District of California, Case No. 2:10-cv-07747-FMO-CW		

6. Organizational Victims and Bankruptcy Cases. Provide any information required under Fed. R. App. P. 26.1(b) (organizational victims in criminal cases) and 26.1(c) (bankruptcy case debtors and trustees). Fed. Cir. R. 47.4(a)(6).

☑ None/Not Applicable ☐ Additional pages attached

TABLE OF CONTENTS

Page

TABLE OF AUTHORITIES

Page(s)

Cases

Statutes

Other Authorities

TABLE OF ABBREVIATIONS

Abbreviation	Description
Board	Patent Trial and Appeal Board
‘025 patent	U.S. 7,805,025
‘760 patent	U.S. 7,239,760
‘316 patent	U.S. 7,577,316
‘596 patent	U.S. 7,813,596
Vederi patents	Collectively the ‘025, ‘760, ‘316 and 596 patents
Yee	Yee, F., *GPS & Video Data Collection in Los Angeles County, A Status Report*, Position Location and Navigation Symposium, 1994, IEEE, 388-393, Apr. 1994.
Lachinski	U.S. Patent No. 5,633,946
Dykes	Dykes, J., *An approach to virtual environments for visualization using linked geo-referenced panoramic imagery*, Computers, Environment and Urban Systems, Vol. 24, Issue 2, pp. 127-152, March 31, 2000.
Shiffer	Shiffer, M., *Augmenting Geographic Information with Collaborative Multimedia Technologies*, Proceedings of Auto Carto 11, American Society for Photogrammetry and Remote Sensing, American Congress on Surveying and Mapping, pp. 367-376, 1993
Ishida	Ishida, T., et al, *Digital City Kyoto: Towards a Social Information Infrastructure*, Lecture Notes in Artificial Intelligence, Vol. 1652, pp. 23-35, Springer-Verlag, 1999.

I. STATEMENT OF RELATED CASES

This appeal is a consolidation of:

Appeal No. 2022-1477 regarding Reexamination Control No. 95/000,681 (the '681 reexamination) for U.S. patent 7,805,025;

Appeal No. 2022-1478 regarding Reexamination Control No. 95/000,682 (the '682 reexamination) for U.S. patent 7,239,760;

Appeal No. 2022-1479 regarding Reexamination Control No. 95/000,683 (the '683 reexamination) for U.S. patent 7,577,316; and

Appeal No. 2022-1480 regarding Reexamination Control No. 95/000,684 (the '684 reexamination) for U.S. patent 7,813,596.

The Vederi patents are the subject of a patent infringement action CV 10-07747 FMO (CWx) in the Central District of California. The District Court has stayed the proceedings pending resolution of the reexaminations.

II. STATEMENT OF JURISDICTION

On December 16, 2021, the Patent Trial and Appeal Board ("Board") issued final decisions in the '681, the '682, the '683, and the '684 Reexaminations.

Notices of appeal were timely filed with respect to all reexaminations. The appeals were consolidated pursuant to the Court's order dated February 18, 2022.

This Court has jurisdiction over Vederi's appeal under 28 U.S.C. §1295(a)(4)(A).

III. STATEMENT OF THE ISSUES

A. Claim Construction

Whether the Board erred in construing "a second user input specifying a navigation direction relative to the first location" to include a user input that specifies a "navigation direction" that is not specified relative to a "first location."

Whether the Board erred in construing "a composite image created by processing pixel data of a plurality of the image frames" to encompass a "single

image" that includes multiple different views that do not form a continuous single view.

Whether the Board erred in construing "invoking display of the web page" for "the retail establishment" to include the display of information gathered from a web page without invoking display of the web page.

Whether the Board erred in construing "arbitrary address" to cover a user interface where a user cannot input arbitrary addresses and must select from a pre-defined set of valid addresses.

B. Invalidity

Whether the Board's findings that claims 2-6, 8-10, 14-18, 20, 24, 26, 29, 33-38, 41, 42, 44-48, 51-54, 56-60, 63-68, and 70-72 of the '025 patent are unpatentable under 35 U.S.C. §103 in view of Ishida, Dykes, and Yee are supported by substantial evidence.

Whether the Board's findings that claim 8 of the '760 patent is unpatentable under 35 U.S.C. §103 in view of Shiffer, Yee, and Lachinski and whether claims 2, 3, 8, 12-18, 21-26, 29, and 32-37 of the '760 patent are unpatentable under 35 U.S.C. §103 in view of Shiffer and Yee are supported by substantial evidence.

Whether the Board's findings that claims 13 and 18-24 of the '316 patent are unpatentable under 35 U.S.C. §103 in view of Yee, Lachinski, and Dykes are supported by substantial evidence.

Whether the Board's findings that claim 4 of the '596 patent is unpatentable under 35 U.S.C. §103 in view of Yee, Dykes, and Lachinski and that claims 4 and 21 of the '596 patent are unpatentable under 35 U.S.C. §103 in view of Ishida, Yee, and Dykes are supported by substantial evidence.

IV. <u>STATEMENT OF THE CASE</u>

This consolidated appeal arose from the inter-partes reexaminations of four patents owned by Vederi, LLC ("Vederi" or "Patent Owner").[1] Google LLC ("Requester") requested the reexaminations. After a remand from a previous appeal to the Federal Circuit, reopening of reexamination, and appeal to the Board, the Board found new grounds of rejection for the claims at issue. Vederi appeals the Board's decisions of unpatentability.

A. <u>Overview of the Inventions</u>

The Vederi patents relate to systems and methods for visually navigating a geographic area from a user terminal. For example, when the geographic area is a street, the claimed invention displays composite images of the objects on each side of the street (e.g., as if one were moving along the street), and information about businesses depicted in the images. (Appx356, Abstract).

Digital video cameras are mounted on a moving vehicle that drives around an urban area recording image frames of the views of buildings, houses, etc. (Appx377 at 3:46-57; Appx377 at 4:50-58) A GPS receiver and inertial navigation system provide the position of the camera as the image frames are being acquired. (Appx356, Abstract; Appx376 at 2:29-31) The recorded image frames are used to synthesize composite images that preferably provide a wider angle of view than any single recorded image frame (e.g., by stitching two recorded image frames together). (Appx378 at 5:45-51) When requested, the server retrieves the composite images associated with a particular location and causes them to be displayed (Appx381 at

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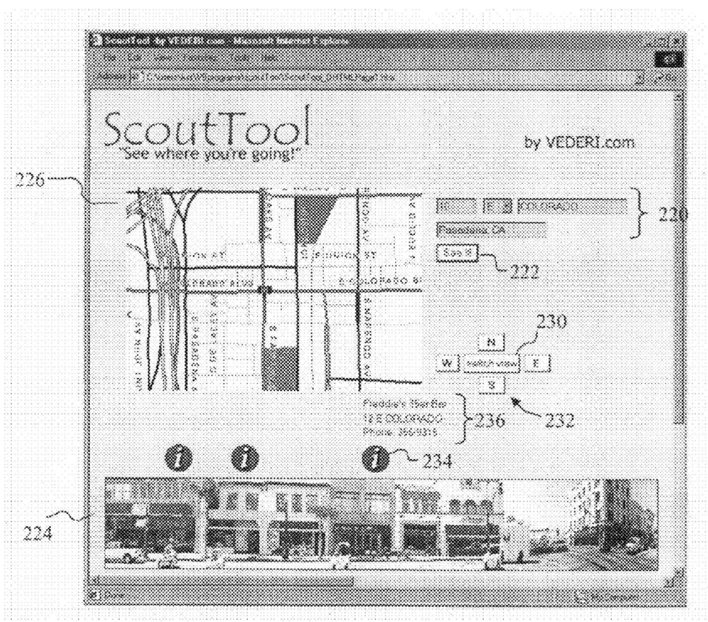
[1] The four Vederi patents stem from a provisional application filed October 6, 2000. (Appx14175-14291) The '760 patent issued on July 3, 2007; the '316 patent issued on August 18, 2009; the '025 patent issued on September 28, 2010; and the '596 patent issued on October 12, 2010. (*See*, Appx292-419)

11:50-53).The composite images depict what one would see if one were actually at the location. (Appx378 at 5:45-51).

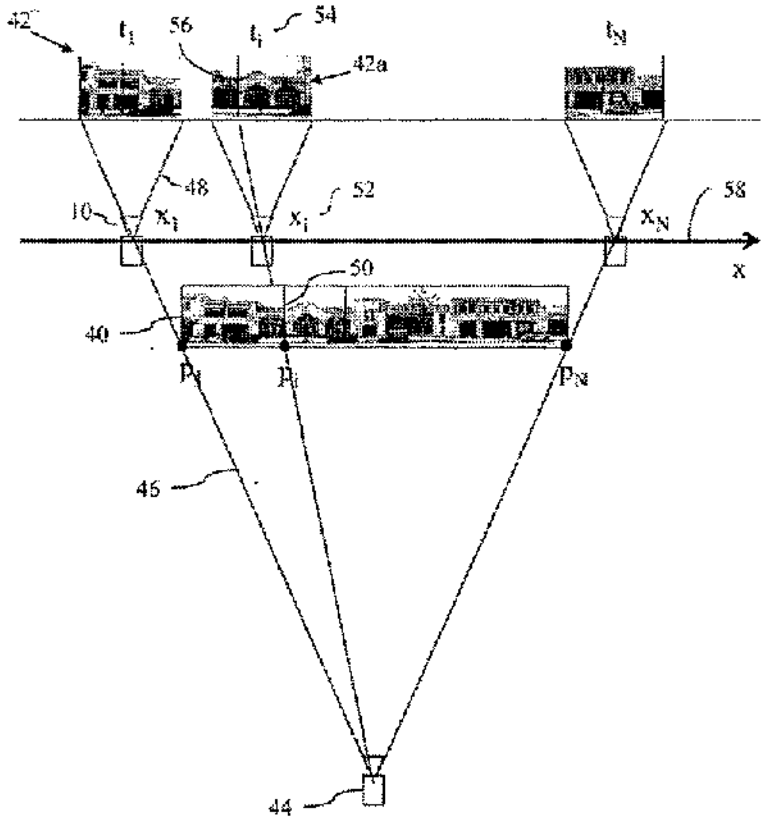
In some embodiments, a server stores the composite images along with their associated geographic information. (Appx380 at 10:26-33). The server receives inquiries from a user about a location within a geographic area as an address or as geographic coordinates of the location, or as a selection of a location on a map. (Appx381 at 11:43-53). The server retrieves composite images associated with the selected location along with a map of the area and information on the businesses in the area. (*Id.* at 12:26-47). The server may cause these images and information to be displayed on a remote user terminal such as a personal computer, a personal digital assistant, and similar devices, such as a smart phone. (*Id.* at 11:56-12:3)

Figure 16 of the Vederi patents (below) shows a computer interface for accessing panoramas 224:



(Appx373)

One method of creating a composite image as disclosed in the Vederi patents is shown in Figure 2 of the patents, below.



(Appx359)

Individual frames 42 are combined to generate a “composite image 40” which has a single wider view of objects in the geographic area that is different from the frames 42 and that is one that a person would see if they were at a location on the opposite side of the street from the depicted buildings. (*See* Appx378 at 5:48-6:5)

In some embodiments, the method uses street segment data, rather than individual addresses, to organize and store the composite images. (Appx376 at 2:40-45) Therefore, the images do not need to be matched exactly to individual addresses, and there is no need to gather or store information about the exact location and span of each address along a street. (Appx378 at 6:37-47).

The images are associated with mathematically interpolated addresses within the street segments. (Appx381 at 11:13-20) When a user enters an address, the system identifies the segment that encompasses that address and calculates where along the segment that address would fall—regardless of whether that address is

assigned to a physical building along that segment. (Appx382 at 13:27-14:14) The system then provides the composite image closest along the segment to the requested location. (*See* Appx382 at 13:27-14:44).

A user may select an initial location by entering an address to see a panorama of the location. (Appx381 at 12:17-19) Selecting "navigation buttons 232" allow a user to navigate through a geographic area in a corresponding navigation direction (e.g., north, south, west, east) relative to a current location. The system then selects a new location ("second location") based on the navigation direction and updates the current location, such that repeated selections of the same navigation button (e.g., the "east" button) navigates the user to new locations along the navigation direction and such that selections of different navigation buttons navigate in different, corresponding navigation directions relative to the current location, where the new location may be in the same segment or in a different segment. (Appx382 at 13:10-20)

B. <u>The Vederi Patent Claims</u>

All of the claims of the Vederi patents are directed to a system or method for enabling visual navigation of a geographic area from a user terminal.

1. <u>The '025 patent</u>

The claims of the '025 patent generally relate to retrieving a first image associated with a first location specified by a user, receiving a second user input specifying a navigation direction relative to the first location, determining a second location based on the navigation direction, and retrieving a second image associated with the second location. (See, e.g., Claim 21 Appx384 at 17:43-18:9.)

Claims 2-6, 8-10, 14-20, 33-36, 58-60 and 64-72 of the '025 patent require the retrieved images to be composite images (Appx383 at 15:64-16:19, 16:24-36; Appx384 at 17:11-42; Appx385 at 19:3-17; Appx386 at 21:42-52, 22:6-48).

Claim 28 of the ‘025 patent relates to invoking display of a web page associated with a retail establishment depicted in the retrieved images. (Appx384 at 18:43-48)

2. The ‘760 patent

The claims of the ‘760 patent generally relate to retrieving a first image associated with a first location specified by a user, receiving a second user input specifying a navigation direction relative to the first location, determining a second location based on the navigation direction, and retrieving a second image associated with the second location. (See, e.g., Claim 1 Appx319 at 15:57-16:9) These features allow a user to navigate relative to a currently displayed location.

3. The ‘316 patent

The claims of the ‘316 patent relate to variations where the second location is identified based on the selection of an icon displayed on the screen, rather than the selection of a navigation direction as recited in the independent claims of the ‘025 and ‘760 patents. (See, e.g., Claim 1 Appx353 at 15:41-57).

Claims 13, 18, and 19 of the ‘316 patent require the retrieved images to be composite images. (Appx353 at 16:37-39).

Claim 20 of the ‘316 patent relates to receiving a first user input as an “arbitrary address.” (Appx353 at 16:62-66).

4. The ‘596 patent

The claims of the ‘596 patent relate to a variation where the second location is identified based on the selection of a position on a map displayed on the screen. (See, e.g., Claim 1 Appx415 at 15:41-64.)

Claim 4 of the ‘596 patent requires the retrieved images to be composite images. (Appx415 at 16:6-9).

Claim 21 of the ‘596 patent relates to invoking display of a web page associated with a retail establishment depicted in the retrieved images. (Appx416 at 18:7-12).

C. The Cited References

1. Yee

Yee discloses a system for viewing video images collected by a van driving through city streets. "A user can point at a road segment or specific location on a computerized map and instantly display the video image(s) for that selected segment. (Appx14108-14109). The images can be displayed as rolling video of four views in a frame or as single-frame images." (Appx14109) Yee discloses that "every house is individually tagged with its address" (*Id.*), which enables the entry of a street address to "retrieve house images" (*Id.*).

Requester introduced Lachinski under 37 CFR §1.948(a)(2) in its February 6, 2013 Comments in the '682 reexamination "to explain Yee's teachings." (Appx3893)

2. Dykes

Dykes discloses a system for displaying multimedia data in association with maps with the objective of supporting student fieldwork (Appx14151). For example, the system can correlate data collected in the field with the location at which the data was collected and display that data on a map. (Appx14164).

Dykes discloses that standard digital cameras may be used with "cheap and accessible panorama software" to stitch captured images into seamless panoramas (Appx14156). Dykes displays, on the map, the locations and the directions in which the images are taken (Appx14159) and the images can be accessed by clicking on a symbol on the map corresponding to that image. Symbols can also be shown within the images to represent other locations that have associated image data. Clicking on those symbols within the panorama cause those images to be displayed (Appx14161).

3. **Shiffer**

Shiffer discloses a system for supporting city-planning activities as focused on a selected site, including assessments of visual environments and illustrations of proposed changes to the visual environments (Appx14085).

"Navigation images" of Shiffer allow a user to "drive or fly through the study area" (Appx14087) and are represented on the map as "linear symbols that represent the routes available to the user" (*Id.*). The navigation images are shown as videos and a controller on screen "allows the user to control the direction of flight (forward or reverse), as well as the speed of flight, by sliding the pointer towards either end of the controller." (Appx14087-14088).

Shiffer discloses that 360° axial views allow a user to look completely around a selected site. Proposed changes to an environment can be seen by showing architectural models and artists' renderings of the changes directly overlaid at the appropriate locations on a map, "along with arrows that are linked to various perspective views" as shown in Figure 3. Selecting an arrow yields an image of an architectural model or rendering in a separate window, with controls allowing users to navigate around the image by 'zooming' or 'panning'." (Appx14088).

4. **Ishida**

Ishida discloses a 3D virtual city corresponding to a real-world city for users to interact with using a 3D interface (Appx14138), which may be built in 3DML, shown using a web browser plug-in (Appx14140). Ishida integrates information extracted from web pages into the 3D virtual city at locations in the virtual city corresponding to real-world locations (Appx14142).

D. **The Board's Decisions on the Reexaminations**

1. **Claim Construction**

The Board concluded that the phrase "composite image created by processing pixel data of a plurality of image frames" should be construed to include "a single

image created by combining different image data or by uniting image data but does not require a single new image with a single view" and that "the limitation of 'processing pixel data of a plurality of image frames' requires no more than taking in and using pixel data from two or more image frames to create the composite image." (Appx18, Appx21).

The Board construed "web page for the retail establishment" as including "a web page that (1) shows particular information about the retail establishment or (2) is associated with a particular retail establishment." (Appx278). The Board further construed "web page" to be "a document on the World Wide Web, consisting of a hypertext file and any related files for scripts and graphics." (Appx279).

The Board construed "arbitrary address" as "can be various addresses, including those based on the user's preference or convenience, and can be an assigned address or an address selected from a group associated with tagged images." (Appx255).

2. <u>Rejection of the claims</u>

The chart below shows the bases for the Board's new grounds of rejection based on prior art.

Patent	Claims	References	Basis
'025	2-6, 8-10, 14-18, 20, 24, 26, 29, 33-38, 41, 42, 44-48, 51-54, 56-60, 63-68, and 70-72	Ishida, Dykes, and Yee	§103
'760	8	Shiffer, Yee, and Lachinski	§103
'760	2, 3, 8, 12-18, 21-26, 29, and 32-37	Shiffer and Yee	§103
'316	13 and 18-24	Yee, Lachinski, and Dykes	§103
'596	4	Yee, Dykes, and Lachinski	§103
'596	4 and 21	Ishida, Yee, and Dykes	§103

V. SUMMARY OF THE ARGUMENT

The Board erred in construing "composite images created by processing pixel data of a plurality of the image frames" to mean "a single image created by combining different image data or by uniting image data" that includes displays showing two or more independent images with discontinuous views.

The Board erred in construing "a second user input specifying a navigation direction relative to the first location" to include a user input that specifies a "navigation direction" that is not specified relative to a "first location."

The Board erred in construing "web page for the retail establishment" to include information collected from web sources on the World Wide Web regarding a retail establishment, without displaying the information as a web page.

The Board erred in construing "arbitrary address" to cover a user interface where a user cannot present arbitrary addresses and is constrained to pre-defined, assigned addresses.

Applying its erroneous claim constructions, the Board erroneously rejected the claims requiring these, and other, limitations. These erroneous rejections include rejections of: claims 2-6, 8-10, 14-18, 20, 24, 26, 29, 33-38, 41, 42, 44-48, 51-54, 56-60, 63-68, and 70-72 of the '025 patent as being obvious over Ishida, Dykes, and Yee; claim 8 of the '760 patent as being obvious over Shiffer, Yee, and Lachinski; claims 2, 3, 8, 12-18, 21-26, 29, and 32-37 of the '760 patent as being obvious over Shiffer and Yee; claims 13 and 18-24 of the '316 patent as being obvious over Yee, Lachinski, and Dykes; claim 4 of the '596 patent as being obvious over Yee, Dykes, and Lachinski; and claims 4 and 21 of the '596 patent as being obvious over Ishida, Yee, and Dykes.

These rejections should be reversed at least because the cited references do not disclose the limitations of the rejected claims when those claims are properly construed.

VI. ARGUMENT

A. Claim construction

1. Standard of review

The Court reviews the Board's legal decisions *de novo* and its underlying factual determinations for substantial evidence. *In re Sullivan*, 498 F.3d 1345, 1350 (Fed. Cir. 2007). Obviousness is a question of law with underlying issues of fact. *Randall Mfg. v. Rea,* 733 F.3d 1355, 1362 (Fed. Cir. 2013). Claim construction is reviewed *de novo* except for subsidiary fact findings based on extrinsic evidence, which are reviewed for substantial evidence. *In re Smith Int'l*, 871 F.3d 1375, 1380 (Fed. Cir. 2017).

2. Legal Principles regarding Ordinary and Customary Meaning under *Phillips*

Because the Vederi patents are now expired, the Board construed the claims based on "their ordinary and customary meaning" as would have been understood by "a person of ordinary skill in the art in question at the time of the invention." *Phillips v. AWH Corp.,* 415 F.3d 1303, 1312-13 (Fed. Cir. 2005); *see also* MPEP 2258(I)(G) (citing *Phillips,* 415 F.3d at 1316; *Ex parte Papst-Motoren,* No. 650-04, 1 U.S.P.Q.2d 1655 (B.P.A.I. Dec. 23, 1986)).

The Federal Circuit has recently emphasized that construing the terms and limitations of the claims based on "their ordinary and customary meaning," involves a focus on the specification of the patent:

> Indeed, the specification is key—it is "highly relevant to the claim construction analysis" and the "single best guide to the meaning of a disputed term." *Phillips,* 415 F.3d at 1315 (quoting *Vitronics Corp. v. Conceptronic, Inc.,* 90 F.3d 1576, 1582 (Fed. Cir. 1996));…

(*Immunex Corp. v. Sanofi-Aventis U.S. LLC*, 977 F.3d 1212, 1218 (Fed. Cir. 2020)), *cert. denied*, 141 S.Ct. 2799 (June 21, 2021) .

The Federal Circuit has emphasized that:

> In most situations, an analysis of the intrinsic evidence alone will resolve any ambiguity in a disputed claim term. In such circumstances, it is improper to rely on extrinsic evidence. *See, e.g., Pall Corp. v. Micron Separations, Inc.,* 66 F.3d 1211, 1216, 36 USPQ2d 1225, 1228 (Fed.Cir.1995)

(*Vitronics Corp. v. Conceptronic, Inc.*, 90 F.3d 1576, 1583 (Fed. Cir. 1996))

Other basic principles of claim construction apply to the ordinary and customary meaning standard. For example, "patentees [are] not required to include within each of their claims all of [the] advantages or features described as significant or important in the written description." *Advanced Fiber Techs. (AFT) Trust v. J&L Fiber Svcs., Inc.*, 674 F.3d 1365, 1380 (Fed. Cir. 2012) (Dyk, dissenting-in-part), (citing, *Golight, Inc. v. Wal-Mart Stores, Inc.*, 355 F.3d 1327, 1331 (Fed. Cir. 2004)) Additionally, all claim terms are presumed to have meaning. *Merck & Co., Inc. v. Teva Pharms. USA Inc.,* 395 F.3d 1364, 1372, (Fed. Cir. 2005) ("A claim construction that gives meaning to all the terms of the claim is preferred over one that does not do so.") See also, *Gen. Am. Transp. Corp. v. Cryo-Trans, Inc.,* 93 F.3d 766, 770 (Fed.Cir. 1996) (rejecting the district court's claim construction because it rendered superfluous the claim requirement for openings adjacent to the end walls).

3. <u>The meaning of "location" in "a second user input specifying a navigation direction relative to the first location."</u>

The independent claims of the '025 and '760 patents recite, in part:

> receiving a first user input specifying a first location in the geographic area;
>
> …
>
> receiving *a second user input specifying a navigation direction relative to the first location* in the geographic area;
>
> *determining a second location based on the user specified navigation direction . . .*

or recite similar limitations. (Appx319 at 15:60-61; Appx319 at 16:3-7; Appx383 at 15:46-47; Appx383 at 15:57-61)

The Board did not explicitly construe these limitations in its Decisions on Appeal and Decisions on Rehearing in the reexaminations of the ‘025 and ‘760 patents and applied these limitations under their “ordinary and customary” meanings.

The Board construed the term “location” in its ‘760 Decision on Rehearing:

> Furthermore, the recited term “location” in claims 1 and 20 can encompass a street or region and is not limited to a particular building or object within the map as Vederi’s arguments appear to imply.
> (Appx228)

The Board’s construction of “location” is inconsistent with the “ordinary and customary meaning” of this term in light of the specification.

For example, in the Detailed Description of the ‘760 patent (emphasis added):

> In a particular use of the system, a *user places inquiries about a location* in a geographic area depicted in the image database 32. For example, *the user may enter an address of the location, enter the geographic coordinates of the location, select the location on a map of the geographic area, or specify a displacement from a current location*.
> (Appx317 at 11:54–59)

See also Appx317 at 12:29–48 and Appx318 at 14:35–59. The specification consistently refers to a “location” based on geographic coordinates or a point along a street segment.

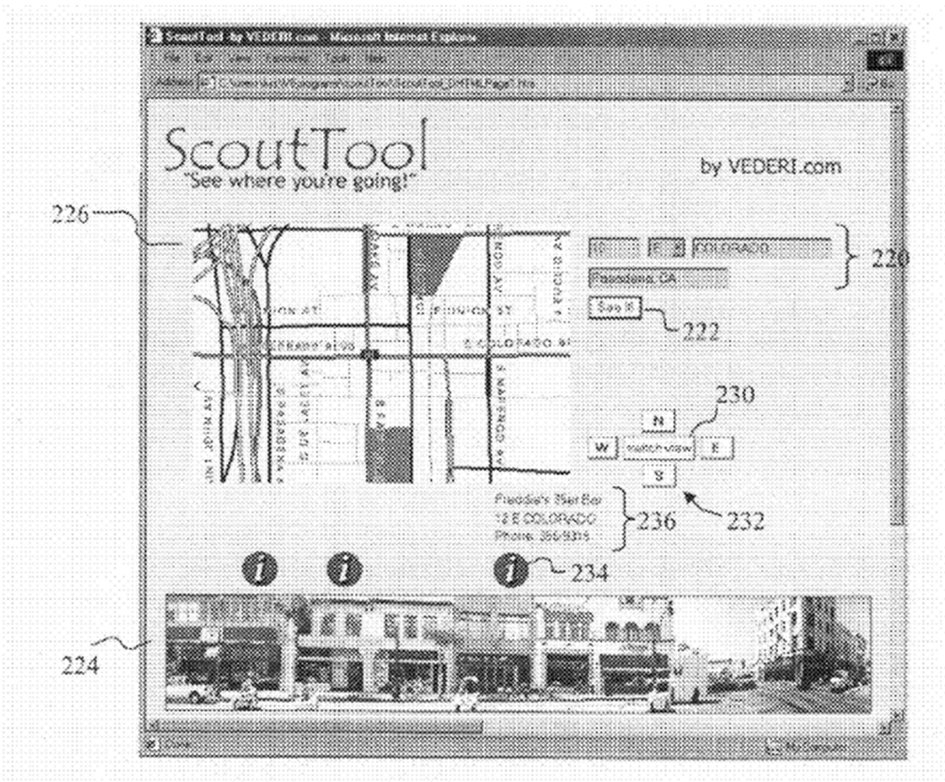
A person of ordinary skill in the art would understand that the ordinary and customary meaning of the term “location” in light of the specification refers to a region identified by an address or geographic coordinates, and would not interpret “location” as encompassing an entire “street or region” as found by the Board.

4. <u>The meaning of "navigation direction" in "a second user input specifying a navigation direction relative to the first location."</u>

The Board did not explicitly construe the "navigation direction" limitation but applied a "ordinary and customary" meaning that was inconsistent with the specification of the Vederi patents to include circumstances where a "direction" is not specified relative to another location.

Regarding a "navigation direction," the '760 patent states, in reference to Fig. 16 (reproduced below), in part (emphasis added):

> The composite image is also updated as the user navigates through the streets using the *navigation buttons **232***. *From a current location, the user may choose to navigate north, south, west, and east by actuating the corresponding buttons.* Preferably, only the navigation buttons corresponding to the possible direction of motions from the current position are enabled. As the user actuates one of the buttons, the current position is incremented by a predetermined amount, currently set to eight meters, to the next available composite image on the current or adjacent segment. The image area **224** is then updated with the new composite image.
> (Appx318 at 13:24-34)



(Appx309)

The specification discloses that the "navigation buttons 232" control the "possible direction of motions from the current position" or current location. (*Id.*)

In view of the specification, one skilled in the art would understand that "a second user input specifying a navigation direction relative to the first location" enables a user to visually navigate along the streets based on the specifying directions of their choosing (e.g., north, south, east, west, etc.) relative to a current location (e.g., "first location")).

5. <u>The meaning of "composite image" in "a composite image created by processing pixel data of a plurality of the image frames"</u>

The '025 Decision on Appeal construes "composite image" on page 20:

> Accordingly, the phrase "composite image" in claims 6, 18, 34, 35, and 68 means a single image created by combining different image data or by uniting image data and the further limitation of "each composite image is created by processing pixel data of a plurality of the image

> frames" in claim 35 means a single image that may be created by combining or uniting image data from a plurality of image frames at the level of pixel data.
> (Appx21)

Similar remarks appear in the ‘316 Decision on Appeal (Appx117-118) and the ’596 Decision on Appeal (Appx160).

However, the Board’s construction of “composite image” did not define “single image.”

Based on the customary and ordinary meaning of the term “composite image” in view of the specification, Vederi respectfully submits that the term “single image” in the Board’s construction of “composite image” would be understood to be an image that depicts a single continuous view and would exclude placing multiple arbitrary images together into a discontinuous arrangement.

The specification provides support for Vederi’s construction:

a) <u>In the Abstract</u>

Vederi’s construction is consistent with the overview of the ‘025 patent provided in the Abstract, which specifically refers to generating a composite image that provides “a panoramic view” (see Appx356, ‘025 patent, Abstract)

b) <u>In the Summary of the Invention</u>

The summary of the invention explains that “[t]he present invention addresses and alleviates the above-mentioned deficiencies associated with the prior art.” (Appx376 at 2:19-20). The summary of the invention refers to the “composite image” and identifies that the “composite image depict[s] a view of the objects from a particular location outside of the path” and “provides a field of view of the location that is wider than the field of view provided by any single image acquired by the image recording device.” (*Id.* at 2:33-39).

c) <u>In the Detailed Description of the Invention</u>

Consistent with this purpose of the invention, the specification provides that

"[i]n essence, the composite images help provide **a panoramic view of the location**." (Appx378 at 5:50-51, emphasis added).

The Detailed Description supports this construction, e.g.:

> *The composite images are created by synthesizing individual image frames acquired by a video camera moving through the location and filming the objects in its view.* (Appx377 at 3:46-49)
>
> The post-processing computer **28** uses the image and position sequences to *synthesize the acquired images and create composite images* of the location that was filmed. *The composite images preferably provide a wider field of view* of the location than any single image frame acquired by the camera **10**. In essence, *the composite images help provide a panoramic view of the location*. (Appx378 at 5:45-51)

Fig. 2 shows a composite image which has a single continuous view of objects in the geographic area that is different from the individual frames from which it is synthesized, *e.g.,* the view that is created is one that a person would see if he or she were at a single location on the opposite side of the street from the depicted buildings. (Appx378 at 5:45–6:5)

Fig. 16 of the Vederi patents and Fig. 11 of the provisional application to which the Vederi patents claim priority show additional examples of composite images, which are reproduced below.

(Appx373)

(Appx14186)

The specification uses "composite image" to mean a new image, created by processing pixel data of a plurality of image frames, that depicts a single continuous view (from a single location) of the objects in the geographical area that is different from any of the views depicted in any one of the image frames from which the composite image is created, such as those shown in the examples above. This is the meaning given by the specification and should be adopted. See, *In re Abbott Diabetes Care, Inc.*, 696 F.3d 1142, 1149 (Fed. Cir. 2012).

6. **<u>The meaning of "a web page for the retail establishment."</u>**

Claim 28 of the '025 patent recites, *inter alia*:

> wherein the particular one of the objects is a retail establishment, the method further comprising:
> *accessing a web page for the retail establishment*; and invoking by the computer system a display of the web page on the display screen.
> (Appx384 at 18:43-48) (emphasis added)

Claim 21 of the '596 patent recites similar limitations (Appx416 at 18:7-12). The Board refers to these as the "Web Page Limitations" and the '025 Decision on Appeal finds that:

> we understand the ordinary meaning of this phrase to include a web page that (1) shows particular information about the retail establishment or (2) is associated with a particular retail establishment.

(Appx23)

Similar remarks appear in the '596 Decision on Appeal. (Appx161)

In its Requests for Rehearing in the reexaminations of the ‘025 and ‘596 patents, Vederi argued that the Board failed to construe the term “web page.” Vederi provided a definition that was adopted by the Board, which found a “web page” to “include a document on the World Wide Web, consisting of a hypertext file and any related files for scripts and graphics.” (Appx193-194)

7. <u>The meaning of “an arbitrary address.”</u>

Claim 20 of the ‘316 patent reads (emphasis added):

> 20. The method of claim 1**,** wherein the first location specified by the first user input is **an arbitrary address** entered via the first user input, the entered arbitrary address specifying information selected from a group consisting of street name, city, state, and zip code.
> (Appx353 at 16:62-66)

Claim 20 modifies the portion of claim 1 that reads “receiving a first user input specifying a first location in the geographic area.”

Vederi submits that “arbitrary address” means “any potential addresses (assigned and unassigned) in the geographic area, not preselected or constrained by the system.”

An “arbitrary *something*,” refers to any member of a set of potential or possible “*somethings*.”[2] The specification refers to an “arbitrary value.” (“In step 82, a time phase is initialized to an arbitrary value using the camera time stamp.” (‘316 Patent, Appx349 at 7:15–20)). In this context, “arbitrary” refers to any of the possible values.

An “arbitrary location” for an event is any of all the potential locations

---

[2] *Arbitrary*, The American Heritage Dictionary, *available at* https://www.ahdictionary.com/word/search.html?q=arbitrary (Defs. 1 and 2) (“*adj.* **1.** Determined by chance, whim, or impulse, and not by necessity, reason, or principle: *stopped at the first motel we passed, an arbitrary choice.* **2.** Based on or subject to individual judgment or preference: *The diet imposes overall calorie limits, but daily menus are arbitrary*.”)

suitable for that event. If one characterized all the potential locations as a set of potential locations, "an arbitrary location" would be any member of that set of potential locations. This set can be limited—e.g., "an arbitrary location in the city of Pasadena" limits the set to locations within Pasadena.

The claimed invention provides the ability to select any potential address within a geographic area and view that address without requiring one-to-one corresponding street images. ('316 Patent, Appx346 at 2:45–49) If the selected address does not correspond to an assigned address, the invention still shows an image of the location along the street where that address would be located if it existed—the selection of an address is not constrained to a pre-defined list of assigned addresses. Therefore, the image database must have images of both *assigned and unassigned addresses* so that when a user keys in an address, even if it is unassigned, an image associated with that unassigned address will be displayed.

One method for supporting arbitrary addresses described in the '316 patent divides each street into segments that correspond to groups of addresses when mapping an area. (*See* Appx348 at 6:37–47). When a user enters an address, the system calculates where along the street segment that address would fall—regardless of whether that address exists. (*See* Appx352 at 13:21–14:14)

In the '316 Decision on Rehearing, the Board found that:

> . . . "an arbitrary address" can be various addresses, including those based on the user's preference or convenience, and can be an assigned address or an address selected from a group associated with tagged images. (Appx255)

The Board's construction of "arbitrary address" renders the word "arbitrary" superfluous. Under the claim construction standards of *Phillips*, the term "arbitrary" must be given weight to distinguish its meaning from the meaning of "address." For example, the term "address" in the Web Page Limitations could reasonably be afforded the same construction that the Board gave to the term "arbitrary address,"

at least because a user already provides a "first user input" based on their "preference or convenience." The Board's construction of "arbitrary address" improperly requires knowing a user's state of mind (their "preference or convenience") when evaluating the scope of the claim.

Vederi submits "arbitrary address" in claim 20 is a limitation on the "first user input," e.g., specifying the first location using an "address" versus specifying "geographic location coordinates" (see, e.g., '316 patent Appx351 at 11:45–48).

The adjective "arbitrary" in "arbitrary address" indicates that the "address entered via the first user input" is entered as an unconstrained choice, e.g., in that it allows both assigned addresses (street numbers assigned to buildings and/or plots) and unassigned addresses (e.g., unassigned numbers located between buildings and/or plots).

In the context of the specification of the '316 patent, including the portions of the '316 patent cited above, Vederi submits that the customary and ordinary meaning of "arbitrary address" means that the user input accepts both unassigned and assigned addresses in contrast to requiring the user to select from a predetermined list of assigned addresses.

B. Invalidity Rejections

1. Claims requiring, *inter alia*, a "composite image" "created by processing pixel data of a plurality of" "image frames acquired by an image recording device moving along a trajectory"

Representative claim 4 of the '596 patent recites, in part (emphasis added):

> wherein the first and second images are each a composite image,
> wherein each composite image is created by processing pixel data of a plurality of the image frames.
> (Appx415 at 16:6-9)

Claim 35 of the '025 patent recites similar limitations. (Appx385 at 19:11-14)

Representative claim 13 of the ‘316 patent recites, in part:

> wherein the first image is a composite image created by processing pixel data of a plurality of the image frames. (Appx353 at 16:37-39)

Claim 4 of the ‘596 patent was rejected under 35 U.S.C. §103 as being obvious over Yee, Dykes, and Lachinski and separately as being obvious over Ishida, Yee, and Dykes. Claims 6, 18, 34, 35, 68, and 69 of the ‘025 patent were rejected as being obvious over Ishida, Dykes, and Yee. Claims 13, 18, 19, 23, and 24 of the ‘316 patent were rejected as obvious over Yee, Lachinski, and Dykes.

a) <u>*Yee* and *Lachinski* do not disclose “Composite Images”</u>

All of the new grounds of rejections rely on Yee, and some of the new grounds further cite Lachinski.

Vederi respectfully submits that the Board has applied Lachinski to an extent beyond rebutting Vederi’s arguments in accordance with 37 C.F.R. §1.948(a)(2). The Board relies on Lachinski for teachings that are not present in the Yee reference. Nevertheless, in the interest of fully responding to the Board’s new grounds of rejection, the below remarks also analyze Lachinski on its merits.

The Board’s ‘025 Decision on Appeal found that:

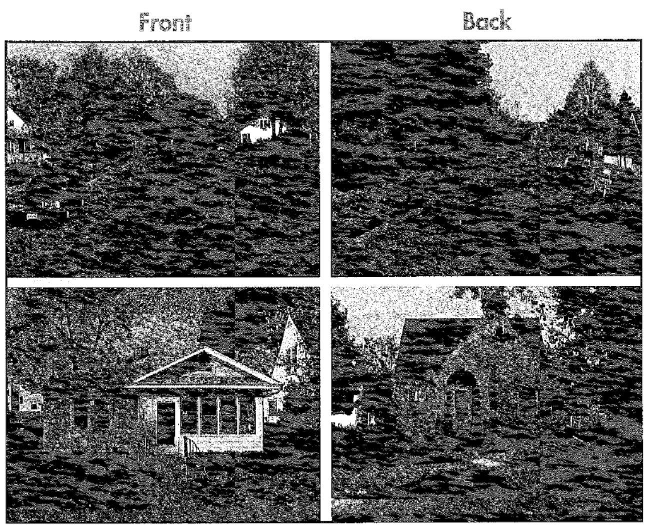
> Yee addresses collected data made available with its product. Yee 389. The data includes provided various views, including “curbside view, front and back,” “street view, front and back,” “real estate view left and right,” “real estate and addresss [sic] zoom, 4-view,” *and* “composites of them.” *Id.* Yee explicitly discloses “composites” *(id.; see* RAN 71) and “them” refers back to the other discussed views, including a front and back curbside view, a front and back street view, and a left and right real estate view. Thus, Yee teaches creating “composites” of these various views.
> (Appx36)

Similar remarks appear in the ‘596 Decision on appeal (Appx165) and the

'316 Decision on Appeal (Appx124-125).

Yee does not disclose "composite images" as properly construed. The only portion of Yee alleged to teach "composite images" is cited above, but Yee does not explain the meaning of "composites of them."

Vederi presented the GeoSpan Brochure "Drive around town on your PC with GEOVISTA," Appx1626-1630 originally attached to Vederi's January 8, 2013 Reply, which includes the below figure, captioned "Street & Real Estate 4-way Composite View:"



Street & Real Estate 4-way Composite View

(Appx1628)

The "Street & Real Estate 4-way Composite View" shown in the GeoSpan Brochure appears to be a collage of the "street view, front and back" and "real estate view left and right" listed in Yee. Vederi submits that this figure clarifies the meaning of "composites of them" as the term was used in Yee, as there is no other evidence in the record associated with Yee reference (e.g., related to the work by GeoSpan) that uses the word "composite" or variants thereof.

Vederi also submits that this rebuts the characterization of Yee as allegedly disclosing a "composite image" when the term is construed based on the *Phillips* standard in view of the specification.

The ‘025 Decision on Rehearing states:

> Although “GeoVista” and “GeoSpan” are discussed in Yee *(see, e.g.,* Yee 388, 392), there is insufficient evidence that the “4-way” view in the GeoSpan Brochure demonstrates the only possible 4-view that Yee creates.
> (Appx207)

Similar remarks appear in the ‘596 Decision on Rehearing (Appx281-282) and the ‘316 Decision on Rehearing (Appx257-258).

Vederi submits that the Board’s reasoning is speculative. Yee and Lachinski provide no examples or definitions of its “composites” and teach no ways to generate composites other than the 4-view.

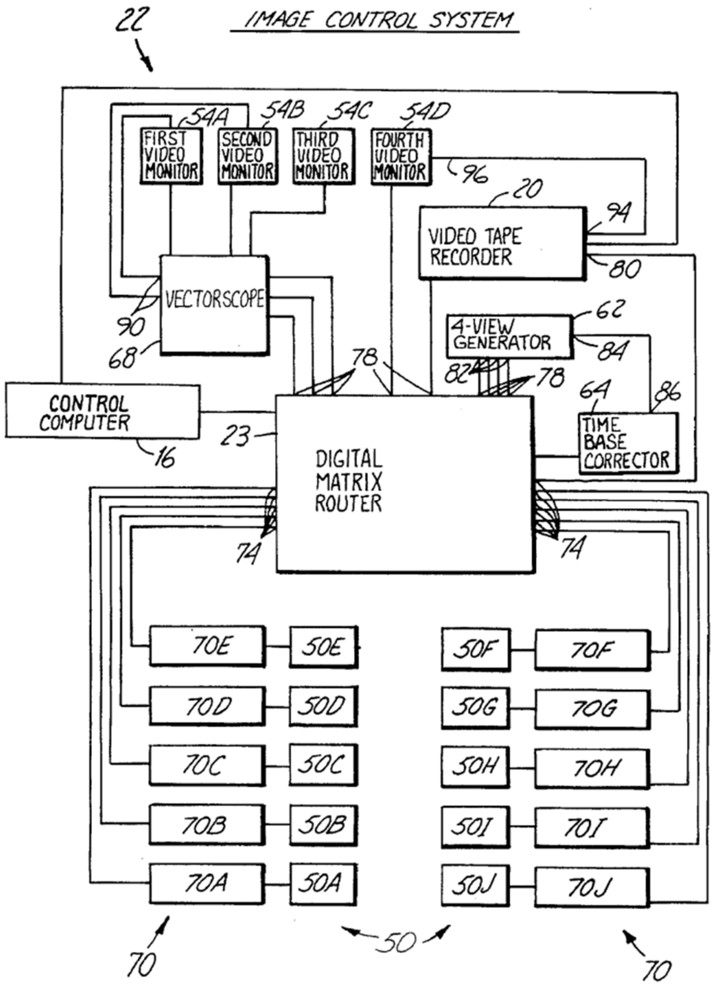
The Board refers to a “four-view generator” in Lachinski at 5:25–31 (Appx14124) as allegedly providing further explanation of the “composite images.” The “four-view generator 62” is the only method taught in Lachinski for combining multiple images and the description of the “four-view generator 62” is consistent with the GeoSpan Brochure’s “Street & Real Estate 4-way Composite View.”

The ’025 Decision on Rehearing further states:

> Also, the reproduced image in the Request for Rehearing (Req. Reh’g 23) is described as a “*4-way* Composite View” *(id.* (emphasis added)), whereas Yee describes the “4-view” as a separate view from the “composite of them” and other views. Yee 389; *see also* Dec. 36 (stating “the [language] ‘composites of them’ is *separate* from the ‘4-view’ in Yee”) (citing Yee 389).
> (Appx207)

The Board’s reliance on “4-view” as allegedly distinct from “composites of them” is incorrect and explained by Lachinski in its description of its sole mechanism for combining images, “4-view generator.”

Figure 3 of Lachinski, below, depicts the “4-view generator” in context.



(Appx14114)

As shown above, a "digital matrix router 23" connects ten "video cameras" 50A through 50J to "video monitors" 54A through 54D, a "video tape recorder" 20, and a "4-view generator" 62. (Appx14123-14124 at 4:35–5:24). Lachinski also describes the views captured by the "video cameras" in a table reproduced below:

CAMERA	VIEW
50A	Driver's Front
50B	Boulevard Front
50C	Stereo Front
50D	Right Side - Short Focal Length
50E	Right Side - Long Focal Length
50F	Driver's Rear

50G	Boulevard Rear
50H	Stereo Rear
50I	Left Side - Short Focal Length
50J	Left Side - Long Focal Length

(Appx14123 at 4:51–63)

Lachinski's cameras 50 appear to capture views corresponding to the "curbside view, front and back; street view, front and back; real estate view left and right; real estate and addresss zoom" of Yee.

Lachinski states that its "digital matrix router" 23:

> provides at a plurality of router outputs 78 *any desired combination of signals received at its inputs 74* as instructed by software located in the control computer 16. (Appx14124 at 5:12–15)

The "four-view generator" 62 takes four inputs, reduces the image represented by each input to ¼ its original size, and "combines the reduced images to form a single video image by placing each of the reduced images into one of the four corners of an output image" which is referred to as a "four-view image." A "time base corrector" 64 holds the four-view image in a buffer to provide enough time for the image to be stable ("approximately one tenth of a second") to be accurately recorded by the "video tape recorder" 20. (Appx14124 at 5:25–40)

The "four-view image" produced by the "four-view generator 62" is supplied (through "output" 84 to the "time base corrector" 64) as one of the inputs to the digital matrix router 23.

Because the "digital matrix router" 23 provides at its outputs "any desired combination of signals received at its inputs," Lachinski explains how the "four-view generator" of Lachinski can also create a four-view image where one of the four views is a previously generated "four-view image."

The "composites of them" of Yee can therefore include a "4-view" adjacent other views, such as a real estate view, within a 4-view composite image because

Yee and Lachinski do not teach any other way to combine views.

Finding Yee and Lachinski to teach any type of "composite" other than the "4-view" is speculative and unsupported by the record.

The four-view images described in detail in Lachinski and depicted in the GeoSpan brochure show four separate and distinct images that are placed in a two-by-two grid, without forming a single continuous view. The four images may be selected for combination arbitrarily (Appx14124 at 5:10–16) and regardless of whether they form a single continuous view.

Yee and Lachinski do not describe any combinations of views that would result in a single continuous view and do not disclose a "composite image" as construed in view of the Vederi patents.

b) ***Yee, Lachinski,* and *Dykes* in combination do not disclose Composite Images**

Vederi submits that one skilled in the art would not have combined Yee, Lachinski, and Dykes to arrive at "composite image" as properly construed.

The '025 Decision on Appeal states:

> Dykes teaches and suggests creating images that "are each a composite image" because of the reasons similar to those previously discussed when addressing claim 33. That is, Dykes teaches creating panoramas, which are single images created by combining and uniting different image data (e.g., the nine images in the upper left in Figure 2) through a stitching technique. *See* Dykes 134-36, Fig. 2. Dykes thus illustrates how images taken at different points can be stitched together to yield *a single, composite image. See* RAN 25 (citing Dykes 134-35, Fig. 2);
> (Appx40)

Similar remarks appear in the '596 Decision on Appeal (Appx166-167) the '316 Decision on Appeal (Appx129-130).

The Board underestimates the challenges involved in the Board's proposed use of the techniques of Dykes to stitch together images captured in accordance with Yee.

For example, one possible interpretation of the Board's combination is to connect a module configured to perform the stitching technique of Dykes to the "digital matrix router 23" of Lachinski (e.g., in place of the "4-view generator").

One skilled in the art would understand that stitching together high-resolution images such as those captured by the system described in Yee[3] using the computers available at the time would take minutes, which is far longer than the time available based on the 30 frame per second capture rate of the system of Yee. In contrast, the four-view generator of Lachinski can be implemented entirely using analog electronics and can generate the four-view within about one-tenth of a second as described in Lachinski (Appx14124 at 5:38–39).

Alternatively, the Board's suggested combination would apply the stitching technique to images captured by Yee at different times using the same camera. One skilled in the art would understand that the "panorama software" described in Dykes could not be used to generate panorama using image frames captured by Yee as suggested by the Board, at least because Dykes merely discloses generating panoramas based on rotating a camera in a full circle of 360° to capture images with a small overlap and does not disclose generating panoramas using images captured from different locations. See, e.g., Dykes at 132 (Appx14154) and Fig. 2 of Dykes, reproduced below:

[3] "Each camera uses 3-CCD (charged couple devices) sensors with a resolution of 750 lines for a high quality professional color image." Yee at 391 (Appx14108)

Fig. 2. Stitching a panoramic image using PhotoVista: Combestone Tor, Dartmoor. Images are taken in the field with a small overlap (top left) and loaded into the software for stitching (top right). The result is a continuous panorama (bottom).

(Appx14157)

There appear to be two potential sets of images captured by Yee that could be combined according to the Board's combination. One possible set of images are captured at the same time by different cameras in the four directions of Yee (front, back, right side, left side) and a second possible set of images are captured at different times by the same camera (e.g., images captured by the same left side camera at two different times). It is unclear on which sets of images the Board is proposing to combine.

Regarding the images captured at the same time, page 391 of Yee describes its cameras as follows:

> The cameras provide coverage 10-40 meters in front of the vehicle and over a horizontal angle of 63 degrees. (Appx14108)

Lachinski provides little detail about the orientations of these cameras apart from their descriptions in the "view" column of the table at 4:51–63 (Appx14123).

However, it does not appear that these cameras provide sufficient coverage to cover 360° with overlap.

One skilled in the art would understand that the two "long focal length" cameras have narrow fields of view that fully overlap with the fields of view of the "short focal length" cameras. The "stereo front" and "stereo rear" cameras of Lachinski appear to support stereo photogrammetric processes (Appx14129 at 16:18–33), where these "stereo" cameras completely or nearly completely overlap in field of view with a corresponding "main" camera (but physically offset to introduce parallax). Therefore these "long focal length" and "stereo" cameras would be redundant for generating 360° panoramas.

Assuming the remaining cameras provide a horizontal angle of 63° in each of the four directions (front, back, right, and left), the total horizontal angle coverage is 4×63°=252° and therefore would not provide 360° coverage and would not have overlap between the images. Furthermore, the cameras are in different parts of the van, and therefore, even if they did overlap, those overlapped portions would exhibit parallax. These parallax inconsistencies would cause a stitching technique of Dykes to fail or to generate panoramas with errors. Therefore, Yee and Lachinski do not capture images with a "small overlap" that can be stitched into panoramas.

Regarding the images captured at different locations, in the '025 Decision on Appeal, the Board cites pages 134–36 of Dykes as allegedly teaching "how images taken at different points can be stitched together to yield a single, composite image." (Appx26)

However, Vederi submits that Dykes at pages 134–36 (Appx14156-14158) does not describe a technique of stitching together "images taken at different points," and only describes stitching together images taken from the same point or location, but in different viewing directions (by rotating the camera).

For example, in subsection 5.1, of Dykes states, in part:

> Fig. 2 shows the way in which a series of digital images

> are combined to produce a panorama.
> (Appx14156)

However, Figure 2 of Dykes (reproduced above) shows how images captured at a single point and looking outward in different directions can be stitched together.

Subsection 5.2 of Dykes (Appx14156, Appx14158) provides a survey of "Geographic uses of panoramic imagery" in reference to work by other researchers.

Subsection 5.3 of Dykes (Appx14158) explains the design of the software that the authors developed for supporting "fieldwork teachers" based on existing constraints and comparisons to then-available software solutions.

Cited pages 134–36 of Dykes therefore do not disclose stitching together "images taken at different points."

Vederi further submits that it would have been prohibitively expensive to combine the teachings of Yee and Dykes. For example, Yee states, in part:

> At the time of the writing of this paper, 13,000 miles had been driven on the GeoVan. Of those miles, 8,000 of them are "good" miles, ie. miles covered only once. We estimate another 20,000 miles to go in LA County. . . .
> You will note the uncertainty as to miles covered. *The procedure for exact mileage computation still awaits processing of the tapes which because of their large numbers defies completion.*
> (Appx14110)

Vederi respectfully submits that if merely computing the miles covered by the GeoVan "defies completion" due to the "large numbers," performing the computationally expensive task of stitching high resolution images together into panoramas would slow down and add expense to a manually intensive approach that was already slow and costly.[4] Creating panoramas in Yee using the technique of Dykes would have delayed completion of a product that already "defie[d]

[4] *See*, *e.g.*, "GEN-2 City Tour BBC & CNBC 1995, January 1, 2004" (Appx9460-9461). *See also* Appx14130 at 17:38-50.

completion."

There is no reason to combine the teachings of Yee and Dykes to arrive at the claimed limitations requiring a "composite image" as properly construed in view of the specification.

Claims 2-6, 8-10, 14-20, 33-36, 58-60 and 64-72 of the '025 patent, claim of the '596 patent, and claims 13, 18, and 19 of the '316 patent also require the retrieved images to be composite images. Therefore, these claims are also not obvious in view of combinations of references that rely on Yee and Dykes.

c) *Ishida* in combination with *Yee* and *Dykes* do not disclose Composite Images

Claims 4, 69, and 72 of the '596 patent, which depend directly or indirectly from claim 1, and claims 4 and 21 of the '596 patent are rejected under 35 U.S.C. §103 as allegedly being obvious over Ishida in view of Yee and Dykes.

However, Ishida does not appear to describe generating composite images using 2D photographs and therefore does not supply the above-discussed deficiencies of the combination of Yee and Dykes.

2. Claims requiring, *inter alia*, "a first location in a geographic area" and a "second user input specifying a navigation direction relative to the first location"

Claims 1, 43, and 55 of the '025 patent and claim 1 of the '760 patent recite, in part:

> receiving a first user input specifying a first location in the geographic area;
>
> …
>
> receiving *a second user input specifying a navigation direction relative to the first location* in the geographic area;
>
> *determining a second location based on the user specified navigation direction; and*
>
> retrieving from the image source a second image associated with the second location.

(e.g., Appx383 at 15:46-47 and Appx383 at 15:57-62)

Canceled claims 13 and 21 of the ‘025 patent and canceled claim 20 of the ‘760 patent recite similar claim limitations.

a) <u>The cited combination of Yee and Dykes fails to teach at least the limitations “receiving a first user input specifying a first location in the geographic area; . . . receiving a second user input specifying a navigation direction relative to the first location; determining a second location based on the user specified navigation direction”</u>

The ‘025 Decision on Appeal presented new grounds of rejection of claims 17, 33, and 67 of the ‘025 patent based on the combination of Ishida, Yee and Dykes. The analysis treated claim 33, which depends from claim 21, as a representative claim. Claims 17 and 67 recite similar limitations, which the ‘025 Decision on Appeal finds unpatentable for the same reasons as claim 33 (Appx34-35).

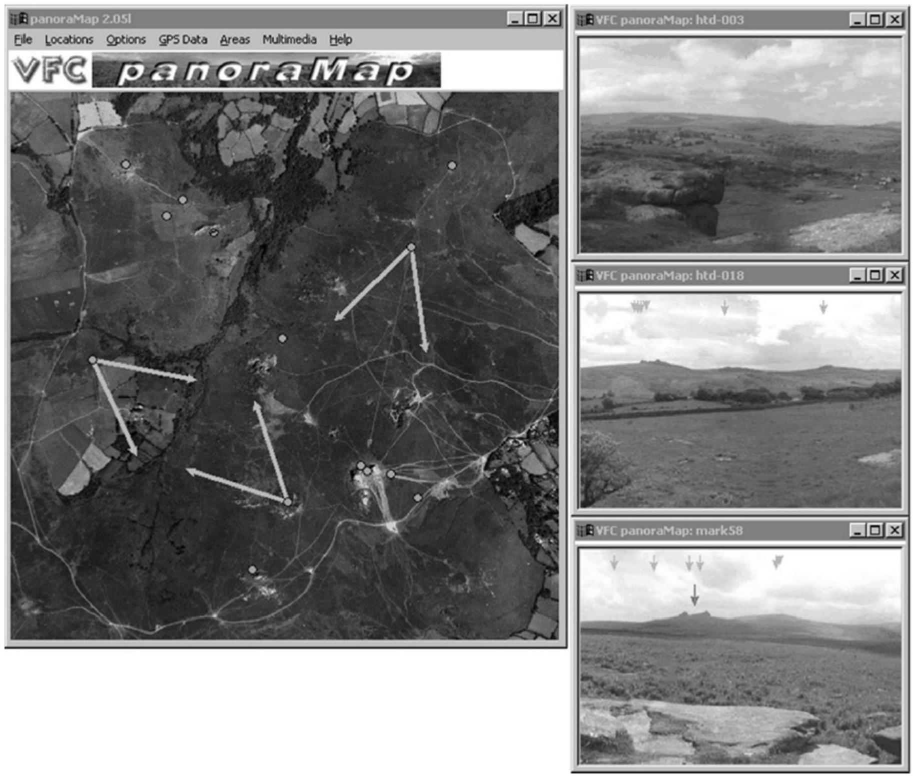
Regarding claim 33 and referring to Dykes, page 26 of the ‘025 Decision on Appeal states:

> Dykes discusses displaying arrows in portions of panoramic image (e.g., arrows in "VFC panorama:htd-018" and "VFC panorama:mark 58" of Figure 4) in a viewer. Dykes 137, 141, Fig. 4. Dykes also explains a user can select another section of the image (e.g., moving the cursor right or left in the viewer around an arrow or "receiving ... a second user input specifying a navigation direction relative to the first location in the geographic area" as claim 21 recites) and based on this selection, Dykes teaches processing a new image at another location according to the selected section. *See id.* at 137-39, Fig. 3. (Appx27)

The ‘025 Decision on Appeal found that the “arrows” shown in “VFC panorama:htd-018” and “VFC panorama:mark58” of Figure 4 of Dykes teach “a

second user input specifying a navigation direction relative to the first location in the geographic area."

Fig. 4 of Dykes is reproduced below:



The "arrows" in the viewer may be referred to as "symbols." Dykes states that the "[s]ymbols within the viewer *provide links* to the other panoramic images," (Appx14163). Each of these symbols corresponds to exactly one location. Activating a link opens a viewer window displaying the panoramic image captured at that location. This linking is performed regardless of a first location that was selected by the user—clicking on three different symbols on the panorama in a viewer window will result in showing three different viewer windows corresponding to different locations. Accordingly, selecting the "symbols" or "arrows" of Dykes do not disclose at least "receiving *a second user input specifying a navigation direction relative to the first location* in the geographic area; determining a second location based on the user specified navigation direction; and retrieving from the image source a second image associated with the second location" as recited, for example,

in the claims 17, 33, and 67 of the '025 patent, at least because the selection of a "symbol" in Dykes directly selects a "second location" without specifying a navigation direction and determining the second location based on the navigation direction.

The Board responded to these arguments (emphasis added):

> Also, selecting an arrow to the right or the left of a given arrow within "VFC panorama:htd-018" and "VFC panorama:mark 58" of Figure 4 in Dykes suggests "receiving a second user input specifying a navigation direction" (e.g., right or left) "relative to [a] first location" contrary to Vederi's contentions. *Thus, although each arrow corresponds to a particular location, when a user navigates right or left between different arrows within a panoramic image, for example, the specified "user input" is relative to another location and "specif[ies] a navigation direction"* as recited in the canceled independent claim 21. See 3PR Comments 14-15 (citing Dykes 139-40, 142) (reproducing Dykes, Fig. 4) (Appx199)

Cited VFC panoraMap:htd-018 from Figure 4 of Dykes is shown below. The Board appears to find that selecting, for example, an arrow on the left side or the arrow on the right side discloses the limitation "receiving by the computer system *a second user input specifying a navigation direction relative to the first location* in the geographic area" as recited in the independent claims of the '025 patent because the location associated with the selected arow has some direction with respect to "another location" corresponding to the "first location" as recited in the claims.

(Appx14163)

Dykes discloses that "symbols within the viewer provide links to *other* panoramic images" (emphasis added), and it is unclear which portion of Dykes relates to "another location" or "first location" that the navigation direction is specified relative to. In any case, the selection of an arrow in the panorama does not "specify" a navigation direction relative to a "first location" and then determine a second location based on the navigation direction because the second location is determined directly from the selection of the corresponding arrow without an additional step of specifying a navigation direction as recited in the claims.

It is unclear from the Board's Decisions which portions of Yee and Dykes allegedly teach the limitation "receiving a first user input specifying a first location in the geographic area" in the new grounds of rejection, e.g., to specify the "another location" referred to by the Board at Appx199. Vederi notes that the Board states

that it adopts the findings and conclusions discussed in the Non-Final Office Action and the original Reexamination Request. (Appx24).

Regarding this limitation, Exhibit CC-D of the original Reexamination Request cites Yee at 391–92:

> A user can point at a road segment or specific location on a computerized map and instantly display the video image(s) for that selected segment.
> (Exhibit CC-D Appx993)

However, the Board's Decisions do not explain how the user's pointing at "a road segment or specific location on a computerized map" as described in Yee relates to the panoramas of Dykes such that arrows to the left and right in the panorama specify a navigation direction relative to a first location specified by the selection of a road segment as taught in Yee.

Therefore, the selection of arrows shown in VFC panoraMap:htd-018 of Dykes do not disclose steps including a first user input specifying a first location, receiving a second user input specifying a navigation direction relative to the first location, and determining a second location based on the navigation direction and therefore do not disclose at least the above recited limitations of claim 21 of the '025 patent.

The '025 Decision on Rehearing further finds that a panning feature of Dykes discloses these limitations:

> Additionally, Dykes discusses "[t]he process of selecting a section *v* of the panoramic image to view and representing the angle of the view with arrow symbols can be programmed to occur interactively *when the cursor is moved to the left or right in a viewer*." *Id.* at 137 (emphasis added). Although quoting the above-noted portion in the June 2021 Decision (Req. Reh'g 14), Vederi does not address the panel's discussion related to *moving a cursor right or left* (e.g., a specifying a navigation direction relative to a first location) in the viewer around the arrow.

> *See id.* at 13-18.
> (Appx200)

However, panning a panoramic image does not specify a navigation direction that results in the determination of a second location and, at best, merely selects a portion of the panoramic image to be displayed. For example, Vederi respectfully submits that the ordinary and customary meaning of "location" is that one's location does not change when turning in place (e.g., looking left and right to look in different directions).

Dykes appears to associate each panoramic image with a single location, so merely panning an image does not determine a "second location." See, e.g., Dykes at 139 (Appx14161).

The Decisions do not explain how setting a "section *v* of the panoramic image to view" in accordance with Dykes is used to determine a "second location" based on viewed "section."

Because panning a panorama does not specify a navigation direction and determine a second location based on a navigation direction, Vederi respectfully submits the panning feature of Dykes does not disclose at least the above recited limitations including separate steps of receiving a user input specifying a navigation direction relative to a first location and determining a second location based on the navigation direction.

The '025 Decision on Rehearing states, in part:

> Additionally, as Requester explains, Dykes teaches a "waypoint symbol" (e.g., arrow) in the map or image is geo-referenced *(see* 3PR Comments 14- 15 (citing Dykes 139-140, 142) (reproducing Dykes, Fig. 4)) and thus, for each user selection on a map (or image) associated with an arrow, Dykes at least suggests determining its location (e.g., GPS coordinates) based on the user selection *(see id.* at 14-16 (further citing Dykes 144)).
> (Appx201)

However, the Board does not explain which portions of Dykes disclose the use of the "waypoint symbol" feature of Dykes to "receive a second user input specifying a navigation direction relative to the first location" and "determine a second location based on the user specified navigation direction" as recited in claim 21 of the '025 patent.

Similar limitations appear in claims 1, 13, 43, and 55 of the '025 patent, and therefore Vederi submits that these claims, in addition to claims of the '025 patent that depend from these claims, such as claims 17, 33, and 67, are patentable over the cited combination of Yee and Dykes in the Board's new grounds of rejection.

b) ***Shiffer* and *Yee* fail to teach "navigation direction relative to the first location"**

The '760 Decision on Appeal presented a new ground of rejection for claims 2, 3, 12–18, 21–26, 29, and 32–37 of the '760 patent based on Shiffer and Yee, and also presented a new ground of rejection for claim 8 based on Shiffer, Yee, and Lachinski.

The '760 Decision on Appeal refers to the limitation "a second user input specifying a navigation direction relative to the first location" as the "Navigation Direction Limitation" ('760 Decision on Appeal, Appx77). In the '760 Decision on Appeal, the Board cites Shiffer, finding its "navigation shots or images" (Appx14100) teach the Navigation Direction Limitation.

Vederi submits that the "navigation shots" of Shiffer, combined with Yee, do not teach the Navigation Direction Limitation.

Cited Figure 2, showing the "navigation shots or images" of Shiffer is reproduced below:

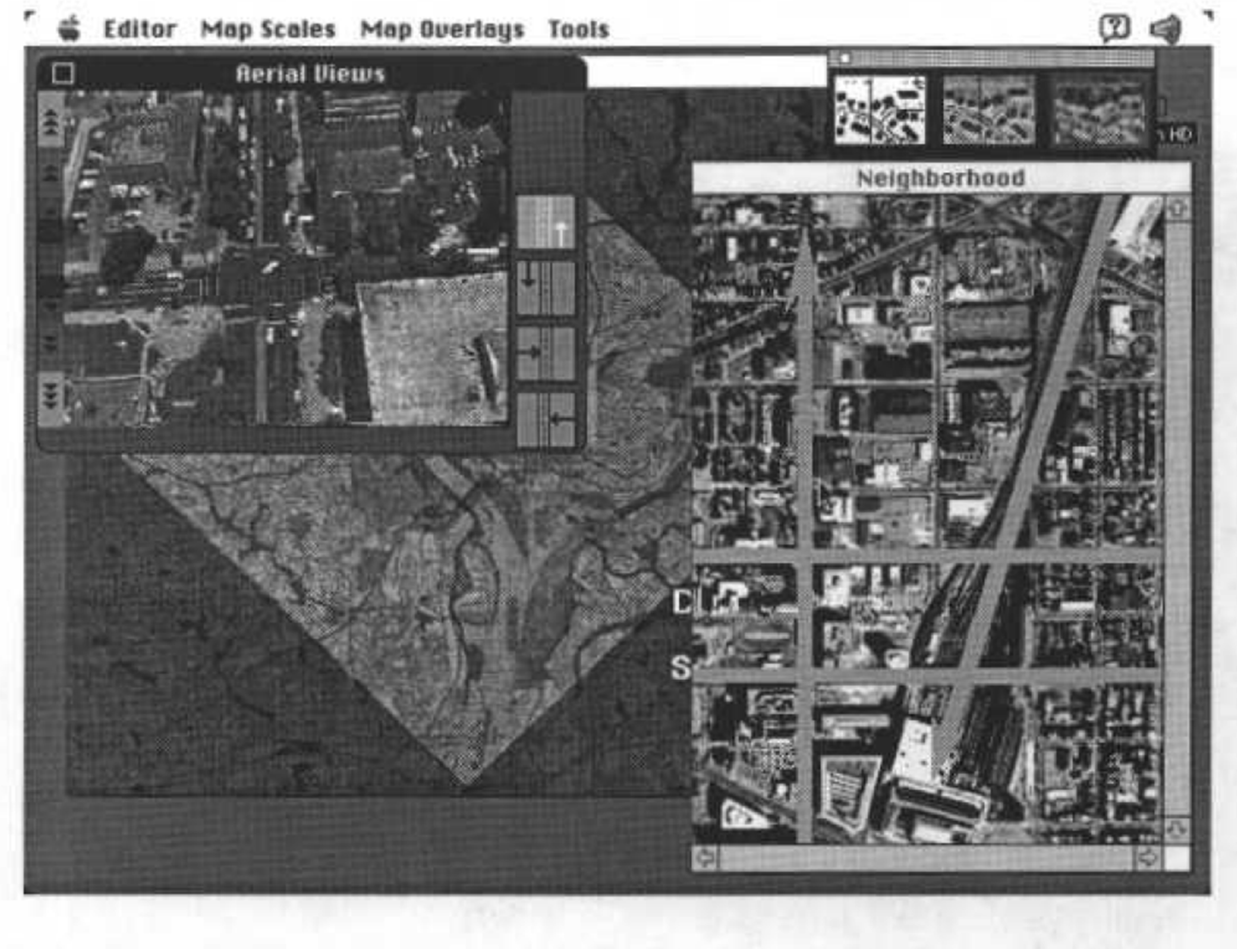


FIGURE 2: Visual Analysis using Aerial Images

(Appx14100)

The Board also finds that:

> Shiffer even further explains that the image in the "upper left comer of Figure 2 represents an oblique navigation image of *a selected street*." Shiffer 372 (emphasis added). Thus, although the linear symbols in Shiffer's "Neighborhood" image in Figure 2 may extend for several blocks as argued by [Vederi], an ordinarily skilled artisan would have recognized the user selects or specifies a specific location (e.g., a street or a particular spot along the linear symbols) in Figure 2's map. Furthermore, the recited term "location" in claims 1 and 20 can encompass a street or region and is not limited to a particular building or object within the map as [Vederi's] arguments appear to imply.

(Appx228)

The Board therefore finds that a "location" as recited in the claims encompasses a "street or region."

Taking the Board's definition of "location" to mean a "street" selected by selecting one of the "large arrows" of Shiffer, Vederi submits that "sliding the controller's pointer in forward direction" would not specify a "navigation direction relative to the first location in the geographic area" because advancing or reversing the playback of the video recording merely specifies a direction *within* the street. This portion of Shiffer does not "determin[e] a second location based on the user specified navigation direction" because sliding the controller of Shiffer would advance the recording of the "flight" to another point *within* the same "location" (on the same street) and does not disclose selecting another location (e.g., a different street or different "large arrow" corresponding to another "location").

Page 10 of the '760 Decision on Rehearing states, citing page 19 of the '760 Decision on Appeal, that Shiffer:

> teaches or suggests controlling the direction of movement or flight through a geographic area (e.g., the geographic area identified by the large arrows in the "Neighborhood" window in Figure 2) from one location (e.g., the originally selected location) to another location by sliding the controller's pointer in a forward or reverse direction. (Appx230)

Under the alternative definition that "location" refers to different points of a flight depicted in the "Aerial Views," Vederi submits that Shiffer does not disclose that, when "the user selects or specifies a specific location (e.g., a street or a particular spot along the linear symbols) in Figure 2's map," the recording of the flight is advanced to a point corresponding to that "specific location."

Vederi further submits that cited page 372 of Shiffer (Appx14100) merely describes the selection of a playback direction for the "video image" of Figure 2 of

Shiffer in a "forward or reverse," but does not specify a "navigation direction" because the corresponding direction merely advances or reverses the playback of a video.

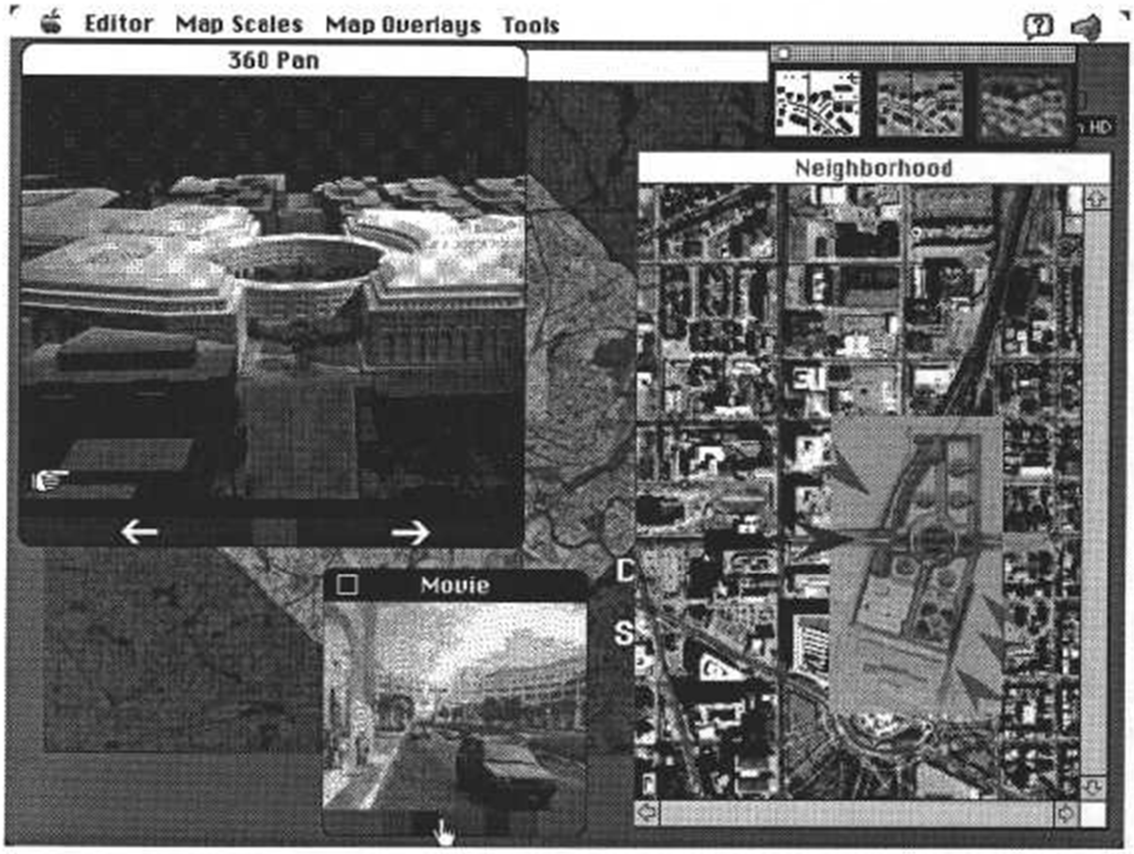
Controlling the playback of the video does not "determine a second location" because Shiffer does not appear to correlate positions in video shown in the "Aerial Views" window with physical locations.

Accordingly, Shiffer does not teach a second user input specifying a navigation direction relative to a first location and does not determine a second location based on the user specified navigation direction as recited in the Navigation Direction Limitation.

The Board provides an alternative ground of rejection based on Figure 3 of Shiffer on page 22 of the '760 Decision on Appeal, namely that Shiffer discloses:

> (1) the user 'can view the proposal from various perspectives around the site by selecting appropriate arrows linked to the map" *(id.)* and (2) the user "can navigate around a specific rendering by zooming and panning with on-screen controls" *(id.)*.
> (Appx85)

Figure 3 of Shiffer is reproduced below:



(Appx14101)

Selecting the arrows in the "Neighborhood" window of Shiffer does not disclose the Navigation Direction Limitation because the selection of any arrow directly shows the view from that arrow. The selection of an arrow does not specify a "navigation direction relative to a first location" and does not determine a "second location" based on a user specified navigation direction.

Vederi further submits that one skilled in the art would understand that "zooming" changes the magnification on a portion of an image without changing a location. For example, if a tall building blocked the view of a landmark from a location, zooming-in would not remove the obstruction because the viewer's location has not changed.

Likewise, Vederi argued that one skilled in the art would understand that

"panning" does not result in a change of location, but instead merely corresponds to a change in orientation of the viewer. Looking to the left or right of the tall building would show other objects in the area that were outside of the initial field of view but would not reveal the mountain peak that was obscured by the building. On the other hand, a change in *location* could reveal the mountain peak hidden behind the building (e.g., a line of sight to the mountain peak is no longer blocked by the building).

Page 13 of the '760 Decision on Rehearing responds:

> Vederi contends "panning an image merely causes the view of the image to shift, such as by rotating or pivoting a camera left or right." *See* Req. Reh'g 12-13 (citing Shiffer 372). But, this contention does not address or rebut the Board's finding related to dependent claims 14 and 15 of the '760 patent, which include a rotating left or right as a moving direction of a navigation button. *See* 3PR Comments 5 (discussing claims 14 and 15 of the '760 patent).
> (Appx233)

Vederi respectfully submits that this finding misreads the limitations of claims 14 and 15, which depend from claim 12. Claims 12, 14, and 15 of the '760 patent are reproduced below:

> 12. The method of claim 1 further comprising:
> displaying a navigation button on the screen of the user terminal; and
> retrieving the image associated with the second location from the image source upon actuation of the navigation button using the user input device.
>
> 14. The method of claim 12, wherein the navigation button indicates direction of motion with respect to the displayed image.
>
> 15. The method of claim 14, wherein the direction of motion includes one of panning left or right, rotating left

> or right, and viewing a direction opposite of a displayed direction.
> (Appx319 at 16:60-65; Appx320 at 17:1-7)

As seen above, claim 14 merely recites that "the navigation button *indicates direction of motion* with respect to the displayed image" (emphasis added).

Furthermore, claim 15, which depends from claim 14, further specifies that the "*direction of motion*" includes "one of panning left or right, rotating left or right, and viewing a direction opposite of a displayed direction."

Regarding the term "direction of motion," the specification of the '760 patent states, in part:

> From a current location, the user may choose to navigate north, south, west, and east by actuating the corresponding buttons. Preferably, only the navigation buttons corresponding to the possible direction of motions from the current position are enabled. As the user actuates one of the buttons, the current position is incremented by a predetermined amount, currently set to eight meters, to the next available composite image on the current or adjacent segment. The image area 224 is then updated with the new composite image. (Appx318 at 13:25–34)

The "direction of motion" indicated on these buttons may include navigation in various directions (e.g., north, south, west, and east) and another "direction of motion" such as "panning left or right, rotating left or right, and viewing a direction opposite of a displayed direction."

While a "direction of motion" can include "rotating left or right" there is no evidence that the "navigation direction" recited in claim 1 must also include "rotating left or right."

Therefore, the Board appears to apply a flawed analysis of the claims of the '760 patent in its construction of the term "navigation direction" to include "rotating left or right."

Vederi further submits that, the "zooming" and "panning" features of Shiffer

merely allow users to look at different parts of *one image*. See Shiffer at 373:

> Selecting an arrow yields an image of an architectural model or rendering in a separate window, with controls allowing users to navigate around the image by "zooming" or "panning".
> (Appx14101)

These portions of Shiffer do not disclose that the "zoomed" or "panned" image results in identifying a second location and "retrieving from the image source a second image associated with the second location" as recited in the claims.

For at least the reasons above, Vederi submits that the new grounds of rejection based on Shiffer and Yee fails to disclose at least:

> receiving a first user input specifying a first location in the geographic area;
>
> …
>
> receiving *a second user input specifying a navigation direction relative to the first location* in the geographic area;
>
> determining a second location based on the user specified navigation direction; and
>
> retrieving from the image source a second image associated with the second location.
>
> (Appx319 at 15:61-62; Appx319 at 16:3-9)

as recited in claim 1 of the '760 patent and similar limitations of claim 20 of the '760 patent.

The portions of Lachinski cited in the '760 Decision on Appeal do not supply these deficiencies of Shiffer and Yee.

For at least these reasons, Vederi requests that the new grounds of rejection of claims 2, 3, 12–18, 21–26, 29, and 32–37 of the '760 patent based on Shiffer and Yee be reversed and that the new grounds of rejection of claim 8 of the '760 patent based on Shiffer, Yee, and Lachinski be reversed and that these claims be allowed.

3. **Claims requiring, *inter alia*, a "web page for the retail establishment"**

Claim 28 of the '025 patent recites, in part:

> The method of claim 27, wherein the particular one of the objects is a retail establishment, the method further comprising:
>
> accessing a web page for the retail establishment; and
>
> invoking by the computer system a display of the web page on the display screen.
>
> (Appx384 at 18:43-48)

Claim 21 of the '596 patent recites similar limitations, which the Board called the "Web Page Limitations."

In the '025 Decision on Appeal, the Board found new grounds of rejection for claims 28, 29, 51, and 63 of the '025 patent and in the '596 Decision on Appeal, the Board found new grounds of rejection for claim 21 based on the same three references: Ishida, Yee, and Dykes.

The Board does not cite Yee and Dykes as disclosing the Web Page Limitations, and Vederi argued in its Requests for Rehearing that Ishida does not disclose the Web Page Limitations, at least because Ishida does not disclose invoking the display of a web page for a retail establishment.

The Board accepted Vederi's definition of "web page" (Appx279) and the Board responded in the '025 Decision on Rehearing (Appx212-213) and the '596 Decision on Rehearing (Appx287-288), citing portions of Ishida that allegedly disclose the Web Page Limitations.

However, none of the portions of Ishida cited by the Board disclose the Web Page Limitations.

Taking each of the citations from the '025 Decision on Rehearing in turn, the first citation relates to "a 3DML WEB plug-in." In context, the cited portion of page

27 of Ishida recites:

> Though there are various approaches for building 3D experiences, we started with 3DML [8] for our initial prototype. People are comfortable moving through 3D spaces with game interfaces such as those currently offered by Doom or Quake, and now offered by the 3DML WEB plug-in.
> (Appx14140)

The American Heritage® Dictionary of the English language provides the following definition of "plug-in":

> plug-in *n. Computers* An accessory software program that extends the capabilities of an existing application. Also called add-in, add-on.

Therefore, a "WEB plug-in" is a software program that extends the capabilities of a "WEB browser." For example, web browser plug-ins have been used to extend the capabilities of web browsers to display documents that were not natively supported by the web browsers' rendering engines such as Adobe® Flash animations, Adobe® Portable Document Format (PDF) files, and 3DML documents.

Ishida's use of a 3DML WEB plug-in to deliver a prototype does not disclose the steps of the Web Page Limitations, such as "accessing a web page for the retail establishment" and "invoking by the computer system a display of the web page on the display screen."

The '025 Decision also cites to the phrase "any site on the WEB" at page 27 of Ishida which reads, in part:

> Some problems exist when downloading gif or jpeg compressed photos: as with any site on the WEB using many graphics, it takes some time when using telephone line connections.
> (Appx14140)

Therefore, this portion of Ishida merely describes problems arising from "downloading gif or jpeg compressed photos" and does not disclose the Web Page

Limitations.

The '025 Decision refers to "a WEB and ftp interface" (Ishida 28). However, this portion reads:

> One solution we're working to implement, is a *WEB and ftp interface* to allow individual shopkeepers to update the advertisement photos on their 3D buildings by themselves. (Appx14141)

Therefore, Ishida merely describes a "WEB and ftp interface" for users to *update photos on their 3D buildings* (e.g., upload photos) but does not disclose the Web Page Limitations.

The '025 Decision on Rehearing also refers back to the '025 Decision on appeal, citing Ishida 23-25, 28, Fig. 1 discussing Ishida's three-layer model as allegedly disclosing the Web Page Limitations. Ishida describes its "three layer architecture" in its Abstract:

> We propose the *three layer architecture* for digital cities: a) the *information layer* integrates both WWW archives and real-time sensory information related to the city, b) the *interface layer* provides 2D and 3D views of the city, and c) the *interaction layer* assists social interaction among people who are living/visiting in/at the city. (Appx14136)

and in more detail in page 25 with reference to Figure 1 (below).

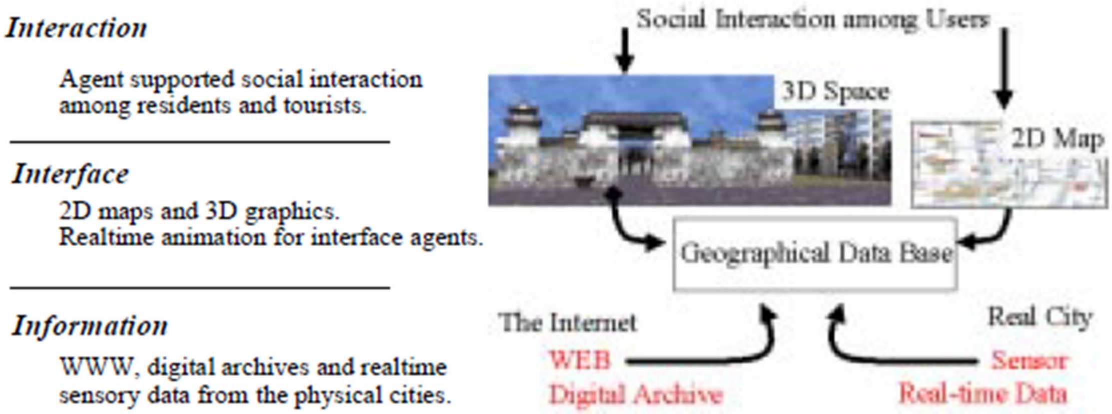


Figure 1: The Three Layers Model for Digital Cities

(Appx14138)

Ishida discloses that, in the "information layer" of the "three layer model" of Ishida, "WWW archives and realtime sensory data are integrated and reorganized using the city metaphor" and the display of a 3D (three-dimensional) virtual space in the "interface layer" to present the collected and reorganized information in a form that is native to the 3D virtual space (e.g., animating city buses moving along their routes Appx14138).

While various portions of Ishida describe integrating WEB data into the virtual city, Ishida does not teach accessing "a document on the World Wide Web, consisting of a hypertext file and any related files for scripts and graphics" of a retail establishment and invoking display of that document on the display screen in accordance with the Web Page Limitations.

Pages 50–51 of the '025 Decision on Appeal find:

> As an example, sensors in Kyoto gather traffic data from buses that send location and route data to the live digital city, and WEB pages for bus stops are retrieved and displayed so that real-time bus data is displayed on the map of Kyoto. See Ishida 29-30, Fig. 5(b); see 3PR Rh'g Request 11 (reproducing Ishida, Figs 5(a)-(b)). As such, each of these web pages in Ishida (e.g., WEB and ftp interface) shows particular information (e.g., bus data)

> about or associated with a retail establishment (e.g., a transportation company having a bus stop).
> (Appx51-52)

However, the only portion of cited pages 29–30 of Ishida that relate to “WEB” states:

> WEB retrieval under the constraint of sensory data is definitely an interesting research issue.
> (Appx14143)

Pages 29–30 of Ishida do not state that any web page is displayed in the user interface of Ishida. At best, this cited portion of Ishida states that “we are using real-time bus data and display them on the digital city” without stating how the information is displayed in the digital city (e.g., through virtual signage coded using 3DML, animated 3D buses driving down the virtual streets as mentioned in Ishida at 25, etc.) and therefore does not disclose the Web Page Limitations.

The ‘025 Decision on Appeal finds that:

> As previously explained, Ishida’s WEB interface generates a digital city (e.g., a web page) that integrates WEB data from WEB pages and sensory data on a map about or associated with a retail establishment (e.g., a company’s bus stop, parking lot, or restaurant) (Ishida 28-30) and thus "invok[es] ... a display of the web page [for the retail establishment] on the display screen" as claim 28 recites.
> (Appx54)

However, “WEB data” collected from “WEB pages” and displayed within a 3D user interface (e.g., using “3DML” in Ishida) does not “invoke” the display of a web page merely because the 3D environment is displayed by a web browser. For example, a Portable Document Format (PDF) file may contain a report of information collected from various “WEB pages.” However, displaying the PDF file using a PDF plug-in does not make the PDF file or the information contained therein a “web page.” Therefore, this portion of Ishida does not disclose the Web Page

Limitations.

The ‘025 Decision on Rehearing also states that “Additionally, Ishida describes its digital city as ‘the Digital City Kyoto *site* . . .’ Ishida 31 (emphasis added).” Ishida refers to a “web site” in various portions, in which case the “Digital City Kyoto site” appears to refer to a web site that hosts the 3DML interface provided by Ishida. However, Ishida does not disclose that any web pages of the “Digital City Kyoto site” include a web page for a retail establishment.

While the 3DML interface of Ishida may be executed by a 3DML plug-in that is installed in a web browser, Ishida does not disclose that its 3DML interface itself accesses a web page (“a document on the World Wide Web, consisting of a hypertext file and any related files for scripts and graphics”) of a retail establishment and invokes the display of that web page on a display device, and such appears contrary to the integration of the data described in Ishida (see, e.g., Appx14138).

Therefore, Ishida does not disclose the Web Page Limitations as recited in claim 28 of the ‘025 patent and as recited in claim 21 of the ‘596 patent.

4. Claims requiring, *inter alia*, an “arbitrary address”

Claim 20 of the ‘316 patent recites (emphasis added):

> 20. The method of claim 1, wherein the first location specified by the first user input is **an arbitrary address** entered via the first user input, the entered arbitrary address specifying information selected from a group consisting of street name, city, state, and zip code.
> (Appx353 at 16:62-66)

Vederi respectfully submits that the cited Yee, Lachinski, and Dykes references do not disclose the limitations of claim 20 of the ‘316 patent.

Page 35 of the ‘316 Decision on Appeal states:

> As for teaching the "arbitrary address" limitation, Yee discusses a "[s]treet address entry" (Yee 392), street name recording, and individually tagging addresses. See Yee 391-92.

> (Appx134)

Regarding “street address entry,” cited page 392 of Yee states:

> Street address entry will retrieve house images as every house is individually tagged with its address.
> (Appx14109)

Vederi respectfully submits that Yee is silent regarding how its system would respond to the entry of street addresses that were not tagged (e.g., unassigned addresses), and therefore this portion of Yee does not appear to disclose an “arbitrary address.”

Page 35 of the ‘316 Decision on Appeal also states:

> Yee also states that "[a] user can point at a road segment or specific location on a computerized map and instantly display the video image(s) for that selected segment." Id.; see also 3PR Reb. Br. 3 (citing Yee 391-92).
> (Appx134)

However, pointing to a “road segment or specific location on a computerized map” does not specify an arbitrary address, but instead specifies a geographic location on the map, noting that claim 20 further limits the “first user input” to an “arbitrary address” instead of, for example, geographic location coordinates.

Vederi further submits that the addition of Lachinski would not supply these deficiencies of Yee. For example, pages 20–21 of the ’316 Decision cite Lachinski at 16:63–66 of Lachinski. For context, preceding lines are shown below:

> For any specific street address, only one possible position may exist in the database.
> Address parsing is possible using the database provided by the present invention. Address parsing converts a user supplied address to a standard address within the database by matching it to a real address range in the database.
> (Appx14129 at 16:60–66)

These portions of Lachinski merely disclose converting a user supplied address to a standard address that exists within the database of Lachinski. Lachinski

is silent on how it would handle unassigned addresses and there are multiple possible responses (for example, Lachinski could present an error message if the user supplied address did not match any known address).

Pages 20–21 of the ’316 Decision also cite Lachinski at 17:19–20. For context, preceding lines are also shown:

> . . . For each address, there will therefore be a pair of coordinates and a parity for the true address position.
>
> A video image can be recalled for any coordinate pair through the use of a coordinate-video image matching system. The video information is independent from the spatial position information and video frame calculations rely on the segment-video relationship discussed above. This process allows the retrieval of the nearest video image to a coordinate pair.
>
> (Appx14130 at 17:11–20)

At best Lachinski merely appears to describe looking up an address in its database of known addressees (e.g., tagged addresses) to obtain a “pair of coordinates and a parity” and then use this coordinate pair to retrieve the corresponding video image for the assigned address.

Lachinski does not appear to describe how its system handles invalid addresses such as unassigned addresses that do not exist in the database.

Accordingly, the cited portions of the cited references do not appear to disclose the limitations of claim 20 when construed under the *Phillips* standard and Vederi respectfully requests that the new grounds of rejection of this claim be withdrawn.

Claims 21–24 depend from claim 20 and therefore are distinguishable over the art of record for the same reasons as claim 20 and further distinguishable in view of the further limitations recited therein. Therefore, Vederi respectfully requests that the new grounds of rejection of claims 21–24 also be withdrawn.

VII. CONCLUSION AND STATEMENT OF RELIEF SOUGHT

The Board's claim construction and findings of unpatentability of Vederi's claims should be reversed, adopting Vederi's proposed claim constructions and finding Vederi's claims to be patentable.

DATED: August 1, 2022

Respectfully submitted,

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ADDENDUM

TABLE OF CONTENTS

Addendum Page

UNITED STATES PATENT AND TRADEMARK OFFICE

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PTOL-90A (Rev. 04/07)

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

GOOGLE INC.
Requester,

v.

Patent of VEDERI, LLC.
Patent Owner

Appeal 2015-001495
Reexamination Control 95/000,681
Patent 7,805,025 B2
Technology Center 3900

Before DENISE M. POTHIER, ERIC B. CHEN, and IRVIN E. BRANCH, *Administrative Patent Judges*.

POTHIER, *Administrative Patent Judge*.

DECISION ON APPEAL

I. STATEMENT OF CASE

This proceeding returns to us on remand from the Court of Appeals for the Federal Circuit, vacating our previous decisions mailed June 26, 2015, February 29, 2016, and March 1, 2016. *Vederi, LLC v. Google LLC*, 813 F. App'x 499, 501, 505 (Fed. Cir. 2020).

As background, Requester requested an *inter partes* reexamination of U.S. Patent No. 7,805,025 B2 ("the '025 patent"). The '025 patent claims priority to several United States patent applications, the earliest of which is U.S. Application 09/758,717 (now U.S. Patent No. 6,895,126 B2), filed on January 11, 2001. *Id.*, code (60). Pursuant to 35 U.S.C. § 154(a)(2), the term of the '025 patent ended twenty (20) years from the filing date (i.e., January 11, 2001) of the earliest application (i.e., U.S. Application No. 09/758,717) for which a benefit is claimed under 35 U.S.C. §§ 120 and 121. *See* 35 U.S.C. § 154(a)(2) (2013); *see also* the Manual of Patent Examining Procedure (MPEP) § 2701(I). Thus, the '025 patent expired on January 11, 2021.[1]

"No amendment may be proposed for entry in an expired patent." 37 C.F.R. § 1.530(j);see also 37 C.F.R. § 1.121(j) (referring to § 1.530). That is, "[a]lthough the Office actions will treat proposed amendments [during a reexamination proceeding] as though they have been entered, the proposed amendments will not be effective until the reexamination certificate is issued

[1] The MPEP states the Office should "refuse to express to any person any opinion as to . . . the expiration date of any patent, *except to the extent necessary to carry out*: . . . (C) . . . *reexamination proceeding to reexamine the patent.*" MPEP § 1701 (9th ed. rev. 10.2019 June 2020) (emphases added).

and published." 37 C.F.R. § 1.530(k). Notably, "no amendment, other than the cancellation of claims, will be incorporated into the patent by a certificate issued after the expiration of the patent." 37 C.F.R. § 1.530(j).

Accordingly, the reexamination proceeding will now be based on the original patent claims of the '025 patent. Thus, Patent Owner submitted proposed amendments (*see* the January 2013 Amendment) to the claims, including new claims 75–88 (*id.* at 17–19), are improper at this time. *See* MPEP § 2666.01. On the other hand, and even though the '025 patent has expired, any proposed claim amendments to cancel claim (i.e., claims 1, 13, 21–23, 25, 27, 30–32, 43, 49, 55, and 61 (*see* the January 2013 Amendment 4, 6, 8–9, 11–14)) are permitted. *See* MPEP § 2666.01. Additionally, claims 7, 11, 12, 19, 39, 40, 50, 62, 69, 73, and 74 are not subject to reexamination. *See* RAN 1 (box 1b).[2] Based on the foregoing, the reexamination proceeding will now be based on original patent claims 2–6, 8–10, 14–18, 20, 24, 26, 28, 29, 33–38, 41, 42, 44–48, 51–54, 56–60, 63–68,

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[2] Throughout this Opinion, we refer to: (1) the Action Closing Prosecution (ACP) mailed June 21, 2013, (2) the Right of Appeal Notice (RAN) mailed September 24, 2013, (3) the Patent Owner's Appeal Brief (PO Appeal Br.) filed December 24, 2013, (4) the Requester's Respondent Brief (3PR Resp. Br.) filed January 24, 2014, (5) the Patent Owner's Rebuttal Brief (PO Reb. Br.) filed August 12, 2014, (6) the Requester's Appeal Brief (corrected) (3PR Appeal Br.) filed January 24, 2014, (7) the Examiner's Answer (Ans.) mailed July 9, 2014, (8) Requester's Request for Rehearing Under 37 CFR § 41.79 (3PR Rh'g Request) filed July 27, 2015, (9) Patent Owner's Comments in Opposition to Requester's Request for Rehearing (Aug. 2015 PO Comments) filed August 26, 2015, (10) Patent Owner's Request for Rehearing Under 37 CFR §§ 41.77(b)(2) and 41.79 (PO Rh'g Request) filed July 28, 2015, and (11) Requester's Comments in Opposition to Patent Owner's Request for Rehearing (Aug. 2015 3PR Comments) filed August 27, 2015.

and 70–72 of the '025 patent. The noted claims include those requested by the Requester for reexamination and those examined *sua sponte* by the Office. *See* Request for *Inter Parte* Reexamination Transmittal Form 1 (box 9); *see also* June 21, 2013 Action Closing Prosecution 3 (citing MPEP § 2640).

Upon review, we REVERSE the rejection adopted by the Examiner but present new rejections for claims 2–6, 8–10, 14–18, 20, 24, 26, 28, 29, 33–38, 41, 42, 44–48, 51–54, 56–60, 63–68, and 70–72 pursuant to 37 C.F.R. § 41.77(b).

Related Matters

The parties indicate the '025 patent is the subject of litigation, *Vederi, LLC v. Google Inc.*, Civil No. 2:10-CV-07747 AK-CW (C.D. Cal.)[3] and *Vederi, LLC v. Google Inc.*, Case No. CAFC-13-1057, and *Vederi, LLC v. Google Inc.*, Case No. CAFC-13-1296.[4] PO Appeal Br. 2; 3PR Appeal Br. 1, Related Proceedings App. Additionally, the parties indicate that this appeal may be related to U.S. Patent Nos. 7,239,760 B2, 7,577,316 B2, and 7,813,596 B2, which are subject to *inter partes* reexamination having been assigned Control Nos. 95/000,682, 95/000,683, and 95/000,684 respectively. PO Appeal Br. 2; 3PR Resp. Br. 1. The opinions in these proceedings were similarly vacated. *Vederi*, 813 F. App'x 501.

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[3] This case was administratively closed on February 7, 2018.

[4] Cases Nos. 13-1057 and 13-1296 were merged and decided on March 14, 2014. *Vederi, LLC v. Google Inc.*, 744 F.3d 1376 (Fed. Cir. 2014), *reh'g en banc denied.* A petition for writ of certiorari styled as *Google, Inc. v. Verderi, LLC* was filed on October 16, 2014, and denied on June 22, 2015.

Parties Appeals

Patent Owner appealed the decision in the RAN rejecting certain claims (e.g., 2–6, 8–10, 14–18, 20, 33–36, 56–60, 63–68, and 70–72) of the ’025 patent. PO Appeal Br. 3; RAN 1. Requester responded, and Patent Owner rebutted. *See generally* 3PR Resp. Br.; PO Reb. Br.

Requester cross-appealed the Examiner’s determination that certain claims (e.g., 24, 26, 28, 29, 37, 38, 41, 42, 44–48, 51–54, and 63) are patentable or confirmed. 3PR Appeal Br. 8, 40–41. Patent Owner did not respond.

The Examiner’s Answer incorporated the RAN. Ans. 1.

An oral hearing was conducted on May 13, 2015. The transcript of the oral hearing has been made of record.

Another panel[5] at the Patent Trial and Appeal Board affirmed (1) the rejection of certain claims of the ’025 patent based on Yee and Dykes and (2) the non-adoption of rejections of other claims. June 26, 2015 Opinion (“2015 Opinion”) 28 (vacated). Both Requester and Patent Owner requested rehearing. *See* PO Rh’g Request; *see also* 3PR Rh’g Request. The panel declined to change the original decision. February 2016 Rh’g Op. 2, 9 (vacated); March 2016 Rh’g Op. 2, 8 (vacated).

The Federal Circuit vacated our decisions. *Vederi*, 813 F. App’x at 501. In its opinion, the court construed three phrases found in the claims of the ’025 patent. *Vederi*, 813 F. App’x at 501–505. These phrases are: (1) “composite image” (e.g., claims 34 and 35), (2) “moving” within the phrase

[5] The panel consisted of Administrative Patent Judges Pothier, Dillon, and Branch.

"image frames acquired by an image recording device moving along a trajectory" (e.g., canceled claim 21), and (3) "web page for the retail establishment" within the phrase "accessing a web page for the retail establishment; and invoking by the computer system a display of the web page on the display screen" (e.g., claim 28). *Id.* The court specifically agreed with how the panel construed the phrase "composite image" (*id.* at 503), did not fully adopt how the panel construed the phrase "moving" (*id.* at 503–504), and disagreed with how the panel construed the phrase "web page for the retail establishment" (*id.* at 504–505).

Given the claim construction addressed in *Vederi*, we reevaluate (1) the rejection of claims based on Yee and Dykes and (2) the non-adoption of rejections based on (a) Ishida and Dykes and (b) Ishida, Dykes, and Yee.

Claimed Subject Matter

Canceled claims 21 and patent claim 35 are reproduced below:

> Claim 21 (canceled) A method for enabling visual navigation of a geographic area via a computer system coupled to an image source, the computer system including one or more computer devices, at least one of the computer devices having a display screen, the method comprising:
>
> providing by the image source a plurality of images depicting views of objects in the geographic area, the views being substantially elevations of the objects in the geographic area, *wherein the images are associated with image frames acquired by an image recording device moving along a trajectory*;
>
> receiving by the computer system a first user input specifying a first location in the geographic area;
>
> retrieving by the computer system a first image associated with the first location, the first image being one of the plurality of images provided by the image source;

> providing by the computer system the retrieved first image for displaying on a first display area of the display screen;
>
> invoking by the computer system a display of a direction identifier for indicating the viewing direction depicted in the first image;
>
> receiving by the computer system a second user input specifying a navigation direction relative to the first location in the geographic area;
>
> determining by the computer system a second location based on the user specified navigation direction;
>
> retrieving by the computer system a second image associated with the second location, the second image being one of the plurality of images provided by the image source; and
>
> providing by the computer system the retrieved second image for updating the first image with the second image.
>
> 35. The method of claim 21, *wherein the first and second images are each a composite image, wherein each composite image is created by processing pixel data of a plurality of the image frames.*

The '025 patent 17:43–18:9 (emphasis added), 19:11–14 (same).

Prior Art Relied Upon

The record relies on the following as evidence of unpatentability:

Name	Reference	Date
Lachinski[6]	US 5,633,946	May 27, 1997

[6] Requester indicates that Lachinski was cited in its comments to rebut Patent Owner's response and to explain how Yee's four-view images are created. 3PR Appeal Br. 19–20 (citing ACP 68; RAN 72); 3PR Resp. Br. 9–10; February 2013 3PR Comments 23–24. Patent Owner does not rebut this reliance on Lachinski to teach how Yee's 4-view image is created.

Frank Yee, *GPS & Video Data Collection In Los Angeles County: A Status Report, Position Location And Navigation Symposium*, Proc. IEEE Position Location and Navigation 388–393 (1994) ("Yee").

Toru Ishida et al., *Digital City Kyoto: Towards A Social Information Infrastructure*, 1652 Lecture Notes in Artificial Int. from Int'l Workshop on Cooperative Inf. Agents 23–35 (1999) ("Ishida").

J. Dykes, *An Approach To Virtual Environments For Visualization Using Linked Geo-referenced Panoramic Imagery*, 24 Computers, Env't & Urb. Sys. 127–152 (2000) ("Dykes").

Adopted and Withdrawn Rejections

The Examiner maintains the following proposed rejection, for which Patent Owner appeals:

Reference(s)	Basis	Claims	RAN
Yee and Dykes	§ 103(a)	2–6, 8–10, 14–18, 20, 33–36, 56–60, 64–68, and 70–72	15–61

PO Appeal Br. 9.

The Examiner withdrew or did not adopt the following proposed rejections, for which Requester appeals:

Reference(s)	Basis	Claims	
Ishida and Dykes	§ 103(a)	24, 26, 28, 29	3PR Appeal Br. 11–18; ACP 61–63, 66; RAN 62–64, 67

Ishida, Dykes, and Yee	§ 103(a)	37, 38, 41, 42, 44–48, 51–54, 63	3PR Appeal Br. 19–32

3PR Appeal Br. 8, 11, 19.

II. MAIN ISSUES ON APPEAL

We review the appealed rejections for error based upon the issues identified by Patent Owner, and in light of the arguments and evidence produced thereon. *Cf. Ex parte Frye*, 94 USPQ2d 1072, 1075 (BPAI 2010) (precedential) (citing *In re Oetiker*, 977 F.2d 1443, 1445 (Fed. Cir. 1992)). "Any arguments or authorities not included in the brief permitted under this section or [37 C.F.R.] §§ 41.68 and 41.71 will be refused consideration by the Board, unless good cause is shown." 37 C.F.R. § 41.67(c)(1)(vii).

Based on the record, the main issues on appeal are:

(1) As the rejection is currently presented, did the Examiner err in rejecting patent claims 2–6, 8–10, 14–18, 20, 33–36, 56–60, 64–68, and 70–72 of the '025 patent under 35 U.S.C. § 103(a) based on Yee and Dykes; and

(2) Did the Examiner err in withdrawing the proposed rejection of patent claim 28 under 35 U.S.C. § 103(a) based on Ishida, Yee, and Dykes?

III. ANALYSIS

A. Claim Construction

As previously noted, the '025 patent has expired. Because the '025 patent has expired, we give the claims' recitations "their ordinary and customary meaning" as would have been understood by "a person of ordinary skill in the art in question at the time of the invention." *Phillips v.*

AWH Corp., 415 F.3d 1303, 1312–13 (Fed. Cir. 2005); *see also* MPEP § 2258(I)(G) (citing *Phillips*, 415 F.3d at 1316; *Ex parte Papst-Motoren*, 1 USPQ2d 1655 (BPAI Dec. 23, 1986)). Additionally, "[c]laims 'must be read in view of the specification, of which they are a part'" (*Phillips*, 415 F.3d at 1315 (quoting *Markman v. Westview Instruments, Inc.*, 52 F.3d 967, 979 (Fed. Cir. 1995) (en banc))), and "the specification 'is always highly relevant to the claim construction analysis'" (*id.* (quoting *Vitronics Corp. v. Conceptronic, Inc.*, 90 F.3d 1576, 1582 (Fed. Cir. 1996))).

> *1. "wherein the images are associated with image frames acquired by an image recording device moving along a trajectory" (the Image Frames Limitation*[7]*) of canceled claims 1, 13, 21, 43, and 55*

All the claims on appeal depend from one of canceled claims 1, 13, 21, 43, and 55, each of which includes the Image Frames Limitation. The Examiner found this phrase "merely requir[es] on overall movement along a trajectory, and capture of data either while in motion, or not while in motion, or both, meets the claim term." RAN 6. Patent Owner did not discuss this limitation in its appeal brief (*see generally* PO Appeal Br.) but in its rebuttal brief, asserts that the phrase "moving" requires the image recording device to be in motion when acquiring image frames. *See* PO Reb. Br. 4–5, 7–8.[8] Requester states that the Examiner properly construed the above recitation to include taking images "when a device is both in motion and is not in motion

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[7] Requester refers to this limitation as "the 'Image Frames Limitation.'" 3PR Appeal Br. 2.
[8] Notably, 37 C.F.R. § 41.67(c)(1)(vii) indicates that "[a]ny argument . . . not included in the brief permitted under this section or §§ 41.68 and 41.71 will be refused consideration by the Board, unless good cause is shown."

at the moment of image acquisition." 3PR Appeal Br. 9 (quoting RAN 6 (stating "capture of data either while in motion, or not while in motion, or both, meets the claim term")).

The court in *Vederi* construed the term "moving" within the phrase "image frames acquired by an image recording device moving along a trajectory" found in claim 21 of the '025 patent. *Vederi*, 813 F. App'x at 501, 503–504. The court found the term "cover[s] (1) image recording devices that acquire images while moving; (2) image recording devices that acquire images both while moving and while stationary," but not "(3) image recording devices that acquire images only while stationary (although the image recording device moves along a trajectory at other times)." *Id.* at 504.

Notably, the *Vederi* court applied the "broadest reasonable interpretation" when construing the term "moving" and not the "ordinary and customary meaning as understood by an ordinarily skilled artisan" standard set forth in *Phillips*. *Id.* at 504 (stating "[t]he broadest reasonable interpretation requires that the claim construction be reasonable in light of the specification"). Even so, the court considered the Specification in arriving at its construction. *Id.* (citing the '025 patent 2:27–29, 3:47–49, 3:54–57, 4:50–53, 4:55–58, 5:18–19, 5:52–54, 6:58–61, Fig. 9). In particular, the Specification states "an image recording device moves along a path recording images of objects along the path" (the '025 patent 2:27–29), "[m]ovement to the camera 10 is provided by a base, platform, or motor vehicle moving at an average speed of preferably about 20 miles/hour" (*id.* at 4:55–57), and "the camera 10 moves along the path" (*id.* at 5:18). *See also id.* at 4:52–53; 5:52–54, 6:58–61. The *Vederi* court also states "the

[S]pecification contemplates that some photos may be taken while the vehicle is stopped, for example, at an intersection." *Vederi*, 813 F. App'x at 504 (citing the '025 patent, Fig. 9).

Upon consideration, we determine that the ordinary and customary meaning of "moving" within the phrase "the images are associated with image frames acquired by an image recording device moving along a trajectory" in canceled claims 1, 13, 21, 43, and 55, when read in view of the Specification and as understood by an ordinarily skilled artisan, includes an image recording device that acquires images associated with image frames (1) while moving and (2) both while moving and while stationary as long as some images are associated with image frames acquired while the image recording device is moving.

Additionally, and not addressed by the court in *Vederi*, Requester contends that the Examiner erred in construing the phrase, "moving along a trajectory" in claims 1, 13, 21, 43, and 55 to require a specified or predetermined trajectory. 3PR Appeal Br. 2, 8–9 (citing RAN 8, 63). In particular, Requester argues that the Examiner failed to construe this phrase using the broadest reasonable construction. *Id.* at 8–11. Patent Owner agrees with the Examiner's construction of "trajectory," further arguing that "'trajectory' by definition refers to the path of a moving object, not a stationary object." PO Reb. Br. 6 (quoting RAN 8, 72–73). Patent Owner provides two definitions to support its position. *Id.* at 5 (defining "trajectory" as "[t]he path followed by a projectile flying or an object

moving under the action of given forces"[9] and "[t]he path of a moving particle or body, esp., such a path in three dimensions"[10]).

Concerning this dispute, the Examiner states the phrase, "'moving along a trajectory' does not obviate the overall requirement that the image acquisition device travel along the claimed trajectory" (RAN 8) and that "an actual trajectory is clearly required by the claim" (RAN 72). We agree, in essence, because claim 1 explicitly recites "an image recording device moving along a trajectory." We also accept that a plain meaning of "trajectory" includes a "path of a moving particle or body" (PO Reb. Br. 5 (citing The American Heritage Dictionary)). The disclosure of the '025 patent also supports that a trajectory is synonymous with a path. *See* the '025 patent, 3:56 (stating "trajectory/path"). Thus, the ordinary and customary meaning of "trajectory" in claims 1, 13, 21, 43, and 55 consistent with the disclosure of the '025 patent, includes a path, course or route of a moving object (i.e., the recited "image recording device").

We, however, disagree with the Examiner that the recited trajectory is "a *determined* path taken by the data gathering system." RAN 73 (emphasis added); 3PR Appeal Br. 9 (quoting this passage in RAN). Specifically, we agree with Requester that the claim fails to limit the trajectory to one that is "determined" or "specified." 3PR Appeal Br. 9. The '025 patent provides an "illustration of a trajectory" in Figure 9 where a camera is moved along a

[9] *Trajectory*, Oxford Dictionaries, *available at* http://www.oxforddictionaries.com/us/definition/american_english/trajectory (defining "trajectory" (def. 1)). PO Reb. Br., Evidence App., Ex. C.
[10] *Trajectory*, The American Heritage Dictionary (2nd College ed. 1982) 1285 (defining "trajectory" (def. 1). PO Reb. Br., Evidence App., Ex. D.

path (e.g., 110 including streets or blocks) making turns at intersections. The ’025 patent, 3:14–15, 7:58–60; Fig. 9. Arguably, this path of streets (e.g., 110) was determined prior to recording. *See id*. Yet, even in this example, we note that an ordinarily skilled artisan would have recognized that unpredictability or randomness, such as lane shifting that deviate from any purported, predetermined route, exists when moving along the path shown in Figure 9. *See* 3PR Appeal Br. 10. Also, the above-noted example in the Specification is just one example of a path found in the disclosure.[11] The claim 21’s scope however is not limited to this “illustration” of a trajectory. *See* 3PR Appeal Br. 9; *see also Phillips*, 415 F.3d at 1323 (“warn[ing] against confining the claims to th[e specific] embodiments [in the specification]”).

In summary, we find that the phrase “wherein the images are associated with image frames acquired by an image recording device moving along a trajectory” in claims 1, 13, 21, 43, and 55 requires the image recording device moves along a path, course or route, but that the path need not be predetermined or specified, and that the image recording device acquires “the plurality of images” that “are associated with the image frames acquired by an image recording device” (1) while moving and (2) both while moving and while stationary as long as some image frames are acquired while the image recording device is moving.

[11] During a related litigation, *Vederi, LLC v. Google, Inc.*, Case No. 2:10-cv-07747, of the ’025 patent, Patent Owner similarly provided an example of the phrase, “moving along a trajectory” in claim 21 of the ’025 patent to include moving “down a street” (*see* 3PR Appeal Br., Evidence App., Ex. EA-01, p. 21) without qualifying that the trajectory must be specified. *See* 3PR Appeal Br. 10.

2. "wherein the first and second images are each a composite image" of claims 6, 18, 34, 35, and 68, and "wherein each composite image is created by processing pixel data of a plurality of the image frames" of claim 35

Patent Owner and Requester discuss the "composite image" limitations found in claims 1 and 7 (previously amended) of the '025 patent. PO Appeal Br. 12–13; 3PR Resp. Br. 4. Currently, the patent claims on appeal reciting the "composite image" are claims 6, 18, 34, 35, and 68. Just like the Federal Circuit in *Vederi*, we select claims 34 and 35 as illustrative. *See Vederi*, 813 F. App'x at 503 (citing the '025 patent, 19:6–14).

Claims 34 and 35 depend from claim 21. Claim 34 recites "the first and second images are each a composite image, wherein each composite image is created based on a first one of the image frames acquired at a first point in the trajectory and a second one of the image frames acquired at a second point in the trajectory" (the '025 patent 19:6–10); claim 35 recites "the first and second images are each a composite image, wherein each composite image is created by processing pixel data of a plurality of the image frames" (*id.* at 19:11–14).

Patent Owner disputes the claim construction of the particular phrase, "composite image," finding the Examiner's interpretation unreasonably broad. PO Appeal Br. 12–19; PO Reb. Br. 11–12. Patent Owner argues that

> The composite image presents a single new view of the objects in the geographical area. The single new view is different from any of the views depicted in any one of the image frames from which the composite image is created, e.g., it can be a wider view. Moreover, the new view is from a single location as if the viewer was at that location.

PO Appeal Br. 14. To support this position, Patent Owner cites to Figure 2 of the ’025 patent and composite image 40. *Id*. at 15–16. Patent Owner further contends that “[n]othing in the ’025 patent suggests that two or more separate and independent images become a ‘composite image’ as the term is used in the ’025 patent simply because they are displayed simultaneously on a screen.” *Id*. at 17.

The Examiner, on the other hand, finds the phrase, “composite image,” includes combining four images into a single image. *See* RAN 68. Specifically, the Examiner incorporates the Requester’s Comments on pages 20 through 24 of the response filed August 21, 2013 (“Aug. 2013 3PR Comments”). *Id*. In these comments, Requester argues that Patent Owner is reading limitations improperly into the recitation “composite image” and that Yee (as further explained by Lachinski) combines four reduced images into a single image to generate a 4-view composite image using pixel processing. Aug. 2013 3PR Comments 20–23 (citing Yee 389; Lachinski 5:25–31, 13:40–46).

Considering the disclosure, the ’025 patent discusses creating “composite images” by synthesizing images, image data, or image frames but does not address how the images are synthesized or combined. The ’025 patent, code (57), 2:22–24, 2:34–36, 3:46–49, 5:45–47. This disclosure also states image data from each selected image frame 42 is extracted and combined to form the composite image. *Id*. at 5:66–6:1. Although the ’025 patent provides a preference as to how to create a composite image (*see id*. at 6:1–15), we decline to import this particular preference into the recitation “composite image,” which fails to recite the image is created “on a column-

by-column basis" (*id.* at 6:4) or any of the other features of this preferred image creation process (*see id.* at 6:1–15).

Also, the plain and ordinary meaning of "composite" includes "something that is made up of different parts."[12] A single image consisting of data from four reduced image frames is something made from different parts (e.g., a composite). An ordinary meaning of (1) "synthesize"[13] includes "to make (something) by combining different things" or "to combine (things) in order to make something new," and (2) "combine,"[14] includes "to unite into a single number or expression." Thus, the phrase "composite image" consistent with the disclosure and its ordinary meaning should be construed to mean a single image created by combining different image data or by uniting image data.

The Federal Circuit agreed with this claim construction in *Vederi*, determining the term "composite image" in claims 34 and 35 should be construed as "a single image created by combining different image data or by uniting image data." *Vederi*, 813 F. App'x at 503 (citing the '025 patent, 19:6–14). The court further found the phrase "by processing pixel data of a plurality of the image frames" found in claim 35 specifies "the image may be achieved by combining or uniting image data, meaning at the level of pixel data." *Id.* The court also stated "[w]e are not persuaded by Vederi's argument" that limits the claimed "'composite image' to 'a new image . . .

[12] *Composite* (noun), Merriam-Webster's Online Dictionary (11th ed.), *available at* http://www.merriam-webster.com/dictionary/composite.
[13] *Synthesize*, Merriam-Webster's Online Dictionary (11th ed.), *available at* http://www.merriam-webster.com/dictionary/synthesize.
[14] *Combine*, Merriam-Webster's Online Dictionary (11th ed.), *available at* http://www.merriam-webster.com/dictionary/combine (def. 1c).

that depicts a single new view (from a single location) of the objects in the geographical area that is different from any of the views depicted in any one of the image frames from which the composite image is created.'" *Vederi*, 813 F. App'x at 503 (quoting both the '025 patent, 5:66–6:1 and *Personalized Media Commc'ns, LLC v. Apple Inc.*, 952 F.3d 1336, 1343 (Fed. Cir. 2020)).

Accordingly, the recited "a composite image" in claims 34 and 35 do not require the composite image to be an image having a single view from one location, a new view, a different view, or a wider field of view than any acquired image frame as argued by Patent Owner. Stated differently, "although the specification often describes very specific embodiments of the invention, [the Federal Circuit] ha[s] repeatedly warned against confining the claims to those embodiments." *Phillips*, 415 F.3d at 1323 (citing *Nazomi Commc'ns, Inc. v. ARM Holdings, PLC*, 403 F.3d 1364, 1369 (Fed. Cir. 2005); *Liebel-Flarsheim Co. v. Medrad, Inc.*, 358 F.3d 898, 906–08 (Fed. Cir. 2004)). We thus will not confine the definition of the phrase, "composite image" to the exact representations in the Specification.

Regarding claim 35, Patent Owner also states "[a] person of ordinary skill in the art would further understand" the phrase "composite image is created 'by processing pixel data of a plurality of the image frames' . . . to mean 'an image formed by combining two or more image frames at the pixel level.'" PO Appeal Br. 14. For support, Patent Owner refers to a "Joint Construction of Agreed Terms, Joint Exhibit C"[15] which is listed in its

[15] This Joint Construction appears to be part of the district court proceeding, *Vederi, LLC v. Google Inc.*, Case No. 2:10-CV-07747 (C.D. Cal.).

Appeal Brief's Evidence Appendix as item "1" (*id.* at 40) and described as "Exhibit A hereto" (*id.* at 14 n.1) However, the Joint Construction cannot be located in the Evidence Appendix or in any other part of the briefing.

In an event, Patent Owner asserts "Patent Owner and Requester agreed that 'a composite image created by processing pixel data of a plurality of the image frames' mean[s] 'an image formed by combining two or more image frames at the pixel level.'" *Id.* Patent Owner also argues "[a] person of ordinary skill in the art would also understand that this requires that the pixel values of the composite image are computed from pixel values of the two or more image frames from which the composite image is created." *Id.* at 15 (citing the '025 patent 5:67–6:1). Patent Owner discusses the '025 patent's Figure 2, as well as the '025 patent's Figure 16 and U.S. Provisional Application 60/238,490's Figure 11, as a composite image having "pixel values that are computed from pixel values of each of the image frames from which the composite image is created." *Id.* at 16; *id.* at 17 (reproducing the '025 patent, Fig. 16 and U.S. Provisional Application 60/238,490, Fig. 11).

Claim 35 requires "processing pixel data of a plurality of the image frames." But, this recitation does not recite *how* the pixel data of the images frames are processed, such that pixel values of the composite image are computed from pixel *values* of two or more image frames. We stress that the '025 patent states a *preference* for the composite image to be created by extracting image data from each image frame on a column-by-column basis. *See* the '025 patent, code (57), 6:1–15, Fig. 2. Consistent with *Phillips*, we will not confine the claims to the specific embodiments described in the

disclosure. *See Phillips*, 415 F.3d at 1323. When applying the plain meaning of "processing" (e.g., "*Computers* To perform operations on (data)")[16] as understood by an ordinarily skilled artisan, claim 35 requires no more than "combining or uniting image data, meaning at the level of pixel data." *Vederi*, 813 F. App'x at 503.

Accordingly, the phrase "composite image" in claims 6, 18, 34, 35, and 68 means a single image created by combining different image data or by uniting image data and the further limitation of "each composite image is created by processing pixel data of a plurality of the image frames" in claim 35 means a single image that may be created by combining or uniting image data from a plurality of image frames at the level of pixel data.

3. "accessing a web page for the retail establishment; and invoking by the computer system a display of the web page on the display screen" ("the Web Page Limitations"[17]) of claim 28

Claim 28 ultimately depends from claim 21 and recites, in pertinent part, "accessing a web page for the retail establishment; and invoking by the computer system a display of the web page on the display screen." The '025 patent, 18:46–49.

Patent Owner argues the proper construction for the "web page for the retail establishment" consistent with the '025 patent's disclosure is one that is "owned and controlled by a business establishment." Aug. 2015 PO Comments 7; *see id.* at 5–9 (citing the '025 patent 12:17–19, 12:48–56, Fig.

[16] *Processing*, The American Heritage Dictionary, *available at* https://www.ahdictionary.com/word/search.html?q=process (def. 3 (tr. v.)).
[17] Requester refers to this recitation as "the 'Web Page Limitations.'" 3PR Appeal Br. 2.

16). Requester does not offer an explicit claim construction for this phrase but contends that Ishida provides access to web information that allows user to access indexed websites (e.g., determine restaurant table availability) and thus teaches the Web Page Limitations. *See* 3PR Appeal Br. 3, 15–16.

According to the court in *Vederi*, "[t]he Board limited a 'web page for the retail establishment' to web pages belonging to, owned by, or operated by the retail establishment." *Vederi*, 813 F. App'x at 504 (citing *Google Inc. v. Vederi, LLC*, No. 95/000,681, 2016 WL 792285, at *2–3 (PTAB Feb. 26, 2016)). The court found this characterized interpretation as "unduly narrow." *Id.* The court indicated "an online Yellow Pages directory may be a web page for a retail establishment in that it shows particular information about the retail establishment for the convenience of a consumer" (*id.* at 505) and further states "a web page, such as an online Yellow Pages directory, may be associated with a particular retail establishment, but not owned or controlled by that establishment" (*id.* (citing the '025 patent 12:53–56)).

The Specification does not describe an online Yellow Pages directory but does discuss "business establishments" (the '025 patent 12:48), stating that "the establishment" can be "associated with a particular Web page" (*id.* at 12:53–54). Consistent with the Specification, an ordinary meaning of the recited "web page for the retail establishment" as understood by an ordinarily skilled artisan at the time of the invention would have included a web page in which a business or retail establishment is associated. *See id.* This web page thus may include more than those belonging to, owned by, or

operated by the retail establishment. *See id.*; *see also Vederi*, 813 F. App'x at 504.

Accordingly, although the court did not provide an explicit claim construction for the phrase "web page for the retail establishment" found in the Web Page Limitations, we understand the ordinary meaning of this phrase to include a web page that (1) shows particular information about the retail establishment or (2) is associated with a particular retail establishment.

B. Yee and Dykes

Claims 2–6, 8–10, 14–18, 20, 34, 36, 56–60, 64–68, and 70–72 are rejected under 35 U.S.C. § 103(a) based on Yee and Dykes. RAN 15–61. This rejection was presented on the claims as amended and prior to the '025 patent's expiry. We reverse this rejection given the particular circumstances of this proceeding, which include that the dependencies of the claims have changed since the '025 patent's expiry, the Federal Circuit provided intervening claim construction for claim terms in the '025 patent, and the claims are now construed under *Phillips* as opposed to the broadest reasonable construction. *Compare Phillips*, 415 F.3d at 1312–13, *with Personalized Media Commc'ns*, 952 F.3d at 1340.

However, we present a new ground of rejection for claims 2–6, 8–10, 14–18, 20, 24, 26, 29, 33–38, 41, 42, 44–48, 51–54, 56–60, 63–68, and 70–72 under 35 U.S.C. § 103(a) based on Yee and Dykes pursuant to 37 C.F.R. § 41.77(b). Each of the above claims ultimately depends from one of canceled claims 1, 13, 21, 43, and 55 and thus, each claim includes the limitations found in one of claims 1, 13, 21, 43, and 55. We start our discussion by addressing claim 33, which depends from canceled claim 21.

1. Claim 33

We adopt the findings and conclusions discussed in the Non-Final Office Action and the Request. *See* Nov. 2012 Non-Final Act. 11–14 (citing Yee 389–92, Fig. 1; Dykes 132, 136–42, 144–45, Fig. 6; Request 120–54, Claim Chart CC-D); *see also* Request 120–32 (citing Yee 389–92; Dykes 137, 139–41, 145, Figs. 4, 6; Ex. CC-D; Ex. OTH-B, 61:23–25, 104:16–20, 121:1–3; Ex. OTH-D, 17:7–9), 152 (citing Dykes 132, 139–40), Ex. CC-D 1–11, 24–25 (citing Yee 389–92; Dykes 132, 137, 139–41, 145, Fig. 6; Exs. OTH-B, 61:23–25, 104:16–20, OTH-D, 17:7–9). We emphasize that Yee teaches a vehicle moves and acquires image frames by an image recording device at a certain rate per second. Specifically, Yee teaches recording images of streets, objects, and surroundings (e.g., streets and their names, power poles, street lights, traffic signals, guard rails, houses, house addresses, speed limits, and street signs) with cameras (Yee 389), not just at the same point, but also at a rate of 30 frames per second as the GeoVan travels along streets (*id.*). *See also id.* at 388–90. This illustrates that Yee's van moves to different points in a path or route while acquiring images using image recording devices (e.g., cameras) or its "images are associated with image frames acquired by an image recording device moving along a trajectory" as claim 21, from which claim 33 depends, recites. *See id.* Our findings and conclusions are also consistent with how this limitation (i.e., the Image Frames Limitations) is construed in Section (III)(A)(1).

Additionally, combining Dykes's teachings with Yee would have provided "an excellent source of current micro-, meso- and micro-scale information" (Dykes 132), provided "educational aims" (*id.* at 134), and

been "useful . . . when evaluating sites, buildings, and characteristics of the neighbourhood surrounding them" (*id.*). As such, an ordinarily skilled artisan would have been motivated to include Dykes's teachings in Yee to provide these noted benefits and to improve Yee's system that records images of infrastructure (e.g., streets, power poles, street lights, houses, house addresses, and street signs) (Yee 389) in all four directions (*id.* at 390). *See also* 3PR Resp. Br. 13–14 (discussing using a known technique to improve similar devices in the same way).

Also, combining Dykes's teaching related to displaying symbols, which include dots and arrows on a map (Dykes 139–41, Figs. 4, 6), with the images of Yee's system would have predictably yielded "invoking . . . a display" that provides dots and arrows[18] (e.g., "direction identifier for indicating the viewing direction depicted in" an image) in Yee's visual interface to help with orientation and would have improved Yee's visual interface by permitting the user to navigate within the virtual space and between recognized features. *See* Dykes 137, 139–41, Fig. 4; *see also* Request 122 (stating the combination would have "provide[d] arrows in Yee's visual interface system (VIS) to help user orientation"); 3PR Resp. Br. 13–14 (stating applying Dykes's teaching to improve on Yee's system by displaying arrows to assist with navigating across the virtual space and creating a real sense of space within the virtual environment).

[18] The '025 patent describes "a direction identifier" to include "a dot or an 'X' to identify the side of the street being viewed" or "[a]lternatively, an arrow may be placed near the current location identifier 228 to identify the current viewing direction." The '025 patent 13:6–9.

Regarding the recited "panoramic view of the objects" in claim 33, Dykes teaches how its acquired image frames are used to form a panorama that provides a view of objects within the location that the image is taken. Dykes 134–35, Fig. 2. Specifically, Dykes teaches stitching images from different points within a location together using an overlap feature to form a panorama. Dykes 135, *cited in* 3PR Resp. Br. 15; *see id.* at 134–35. For example, Dykes's Figure 2 teaches and shows nine image frames (upper left) are taken and stitched together with overlap (upper right) to form "a continuous panorama" (bottom). *Id.* at 135, Fig. 2. Thus, Dykes's process of forming panoramas, when combined with Yee, teaches and suggests each of its images can "provide a panoramic view of the objects at respectively" its "locations" as claim 33 recites. *See* 3PR Resp. Br. 16–17 (discussing an ordinarily skilled artisan would have been motivated to stitch Yee's acquired images that overlap as Dykes teaches, to provide panoramic images of a geographic area traveled by Yee's GeoVan or "a panoramic view of objects" at locations as claim 33 recites).

Based on Patent Owner's understanding of the term "moving" in claim 21 as discussed in Section (III)(A)(1), Patent Owner argues "Dykes does not teach 'image frames acquired by an image recording device moving along a trajectory' as recited in claim 21" (and similarly recited in claims 1, 13, 43, and 55). PO Reb. Br. 13–14. This argument is unavailing because as noted above, Yee teaches this feature. Yee 389–90, *cited in* Request 126. That is, as emphasized above, Yee teaches a van (e.g., the noted "GeoVan") moves along a street and acquires image frames along the street using cameras as the van moves. *See id.* at 388–90. Dykes thus need not teach or

suggest the disputed "moving" feature in claim 33, which depends from canceled claim 21.

In its request for rehearing, Patent Owner argues that Dykes does not disclose "displaying a direction identifier" and "receiving a second user input specifying a navigation direction relative to the first location" recited in claim 21, from which claim 33 depends. PO Rh'g Request 4–6. Patent Owner contends the word "arrow" in Dykes at best discusses a directional view. *Id.* at 5–6 (citing Dykes 137, 141, Fig. 4). Patent Owner also argues Yee and Dykes do not teach "determining a second location based on the user specified navigation direction" as claim 21 recites. *Id.* at 6–7. Specifically, Patent Owner argues dragging, navigating, and panning as Dykes teaches does not disclose this feature but merely discloses changing a view. *Id.* at 6–7 (discussing Dykes 136–37, 139–41, 145).

We agree with Requester that these arguments are untimely raised. *See* Aug. 2015 3PR Comments 5–6, 8. In any event, we adopt Requester's remarks in this regard. *Id.* at 6–8 (citing Dykes 139–41, Fig. 4; Request 5–6; RAN 17). Dykes discusses displaying arrows in portions of panoramic image (e.g., arrows in "VFC panorama:htd-018" and "VFC panorama:mark 58" of Figure 4) in a viewer. Dykes 137, 141, Fig. 4. Dykes also explains a user can select another section of the image (e.g., moving the cursor right or left in the viewer around an arrow or "receiving . . . a second user input specifying a navigation direction relative to the first location in the geographic area" as claim 21 recites) and based on this selection, Dykes teaches processing a new image at another location according to the selected section. *See id.* at 137–39, Fig. 3.

Patent Owner also argues that Yee and Dykes "are opposite in nature" and have "cross-purposes." PO Appeal Br. 19–20. Patent Owner asserts that combining Dykes with Yee would defeat the key purpose of Yee, which is to relate images accurately and precisely with the geographic position (e.g., photogrammetry). *Id.* at 20. Patent Owner even further contends that the cost to combine these references would be prohibitive or at greater expense for no apparent reason. *Id.* at 21. We are not persuaded.

Although there are differences between Yee and Dykes, we disagree that they are opposite, such that one skilled in the art would not combine the teachings in these references. As Patent Owner acknowledges, "each [of Yee and Dykes] teaches how to capture and visualize a geographic area." PO Appeal Br. 19. Thus, the references are related to each other in this regard, and an ordinarily skilled artisan would have looked at their respective teachings concerning collecting, creating, and displaying images in a geographic area. *See* 3PR Resp. Br. 12–13 (citing Yee 391–92, Abstract; Dykes 127, 135, 146; RAN 11, 15) (discussing how both Yee and Dykes relate to collecting images of a geographic area and displaying images within an interface). Also and importantly, the rejection relies on Yee—not Dykes —to teach the limitation of "providing by image source a plurality of images depicting views of the objects in a geographic area . . . wherein the images are associated with image frames acquired by an image recording device moving along a trajectory" recited in claim 21. *See* Request, Evidence App., Ex. CC-D, pp. 2–4 (citing Yee 389–90, 392); *see also* 3PR Resp. Br. 16 (indicating that the rejection does not propose replacing Yee's image acquisition process with that of Dykes). Thus, any

differences between how Yee and Dykes collects or acquires image data do not correspond to how the teachings are combined in the rejection.

Contrary to Patent Owner's assertions (PO Appeal Br. 19), one skilled in the art would have recognized the above-noted references' similarities and would not immediately have found the references have cross-purposes. For example, Yee teaches creating a visual interface of a city, permitting a user to point at specific locations within a map, and providing images of the selected location. Yee 388, 391–92; *see also* Request 122 (discussing Yee as "a system for creating a navigable digital city"); 3PR Resp. Br. 12–13 (stating "Yee discloses a Visual Interface System (VIS) that displays the video images of the geographic area to the user" and "a user can point at a street segment or specific location on a computerized map to display the video images for that selected segment"); RAN 15–17 (noting the same features). Dykes similarly teaches mapping views within a geographic area, providing direction views (e.g., through its dots and arrows) within the area to assist a user with orientation, and including interactive symbols at specific locations that provide further images when selected. Dykes 137, 139–41, 146; *see also* Request 122; 3PR Resp. Br. 13 (stating "Dykes promotes teachings that are analogous to those of Yee") (citing Dykes 127, 135, 146); RAN 11 (stating "Dykes discloses a user terminal for visual navigation of a geographic area via a computer system"), 17 (stating "Dykes discloses a user input specifying a navigation direction relative to the first location" and "the user may drag, navigate and pan the field of view"). Thus, as previously discussed, combining Dykes's teaching with Yee would have predictably yielded a visual interface that provides arrows and symbols within Yee's

visual interface to help with orientation and would have improved Yee's visual interface by permitting the user to navigate within its space and between recognized features. *See* Dykes 139; *see also* Request 122; 3PR Resp. Br. 13–14.

We further disagree with Patent Owner that there is a teaching away from modifying Yee as proposed or that including Dykes's teaching would defeat Yee's key purpose. PO Appeal Br. 20–21. Patent Owner argues that Yee's key purpose is to use photogrammetry to relate the images with their geographic positions and to enable accurate surveying. *Id*. at 20. Patent Owner contends that Yee performs photogrammetric analysis, which requires an object to be seen in at least two image frames, each image taken from different locations in space, and that replacing Yee's images with Dykes's panoramic images would make this photogrammetric process impossible, because panoramic views lack parallax. *Id.* at 20–21; PO Reb. Br. 16–18.

Yee does not describe photogrammetry with the stereo option as one of its key purpose. Yee 391–92, *cited in* 3PR Resp. Br. 14–15 (noting photogrammetric software is optional). At one point, Yee states images "can be processed by . . . photogrammetric software to provide latitude and longitude of selected image features in the camera's field of view." Yee 391. Contrary to Patent Owner's contention (PO Reb. Br. 16–17), Yee describes a technique (i.e., "can be") for obtaining latitude and longitude, but not require that the obtained latitude and longitude must be done in this fashion. *See* Yee 391. Yee describes this software as having an *optional* stereo feature that supplies the Virtual Interface System (VIS) with

photogrammetric software to locate objects when supplied with a stereo option and stereo viewing. *Id.* at 392; *see also* 3PR Resp. Br. 15 (noting the same).

We further see no discussion in Yee that "the dimensions and locations of objects in the view are calculated from pixel information" in photogrammetric analysis or that one would not be able to "compute dimensions and locations from a panoramic view because of the lack of parallax" as argued. PO Appeal Br. 20. In other words, Yee does not discuss the need for parallax to compute dimensions and locations. *See generally* Yee. Nor has Patent Owner provided sufficient evidence demonstrating that these features in Yee are required to perform photogrammetry. *See* 3PR Resp. Br. 14 (quoting portions of PO Appeal Br. 20). The record fails to support Patent Owner's contention adequately, essentially relying on arguments of counsel.

Assuming, without agreeing, that Yee requires parallax and its photogrammetric analysis involves calculating objects' dimensions and locations as Patent Owner purports, we agree with Requester that Dykes expressly teaches capturing objects in multiple frames and that some of these objects are located in two frames that overlap when the images are stitched together into a panorama. Dykes 135, Fig. 2, *cited in* 3PR Resp. Br. 15. Moreover, Dykes shows in Figure 2 an example where its stitching technique involves some type of computation of the objects' locations and dimension in order to combine and size the images together properly into the resulting, continuous panorama as shown. *See id.*, Fig. 2.

In the rebuttal brief, Patent Owner argues for the first time that Dykes fails to acquire images that create the panoramic views at two different locations, but rather pans the camera about a fixed point and thus fails to have parallax. PO Reb. Br. 17 (citing Dykes 132[19]). We are not persuaded. As discussed above, Dykes is cited to teach how the acquired image frames as taught by Yee are used to form "a panoramic view of the objects" as recited. Dykes also teaches or at least suggests stitching images from different points together using the overlap feature to form a continuous panorama. Dykes 135, *cited in* 3PR Resp. Br. 15; *see id.* at 134–35. Thus, when combined with Yee, which acquires image frames at different locations as previously discussed, any purported parallax needed by Yee is provided by the image frames that are acquired by Yee's technique, and the image frames are used to stitch images to form the continuous panorama as taught by Dykes.

Concerning Patent Owner's contention that modifying Yee would amount to extra work and greater expense for no apparent reason (*see* PO Appeal Br. 21–22), we disagree. Patent Owner's arguments are misplaced, focusing on modifying Yee's image gathering approach with Dykes's image acquisition technique, which is not how the rejection combines the teachings of Dykes and Yee. *See* RAN 70 (stating "Yee teaches all of the claim with the exception of a direction identifier and specifying a navigation direction relative to the first location for determining the second location"); *see also* 3PR Resp. Br. 16 (noting "Yee and Dykes may be combined to arrive at the

[19] Dyke discloses that the panoramic photos can *show*—not acquire—the view from a chosen location through 360 degree. Dykes 132.

claimed subject matter . . . without replacing Yee's image acquisition process with that of Dykes"). Additionally, as Requester indicates, the arguments presented by Patent Owner related to greater expense and greater work are essentially unsupported by evidence other than counsel's assertions. *See* 3PR Resp. Br. 14–15. These kind of arguments cannot take the place of evidence lacking in the record. *See Estee Lauder Inc. v. L'Oreal, S.A.*, 129 F.3d 588, 595 (Fed. Cir. 1997).

We further adopt Requester's remarks related to Patent Owner failing to provide persuasive evidence that Dykes cannot be combined with Yee. *See* 3PR Resp. Br. 14–17. In particular, Dykes is cited to teach displaying dots and arrows in a user interface (e.g., displaying a direction identifier) as well as linked symbols, which permit the user to select an alternative image/view (e.g., receiving an input specifying a navigation direction as recited in the claims), and to include these features in Yee's interface to improve its system as previously discussed. *See* Dykes 134, 136–137, 139–142, 145, *cited in* RAN 16–17[20]; *see also* 3PR Resp. Br. 13–14. An ordinarily skilled artisan would have recognized to include Dykes's teaching related to dots, arrows, and symbols in a display interface into Yee to improve Yee's system by providing "the ability to navigate across the virtual space" and provide "a real sense of spatiality and immersion that are the essence of virtual environments." 3PR Resp. Br. 13 (citing Dykes 139). Similarly, "Dykes explicitly and specifically explains how the user is enabled to navigate locations by visualizing the location spatially as

[20] The Examiner also cites to Request 120–54, the November 7, 2012 Non-Final Act. 14, and Request, Exhibit CC-D. RAN 15, 19.

represented by symbols (icons) on the map that link the map to images. Dykes at 139-140." RAN 17, *cited in* 3PR Resp. Br. 13. In other words, Dykes teaches a known technique for navigating and visualizing images of a geographic area within an interface, and one skilled in the art would have recognized that Dykes's teaching would have improved on Yee's system in the same manner. *See KSR Int'l Co. v. Teleflex Inc.*, 550 U.S. 398, 417 (2007).

In summary, the record provides an articulated reasoning with a rational underpinning to combine the teachings of Yee and Dykes as proposed and to justify the obviousness conclusion.

2. Claims 17 and 67

Claim 17 depends from canceled claim 13 but includes limitations similar to those in claim 33; claim 67 depends from canceled claim 55 but also includes limitations similar to those in claim 33. Like claim 33, we adopt the findings and conclusions discussed in the Non-Final Office Action and the Request for those limitations in claims 17 and 67 similar to canceled claim 21 from which claim 33 depends. *See* Nov. 2012 Non-Final Act. 11–14 (citing Yee 389–92, Fig. 1; Dykes 132, 136–42, 144–45, Fig. 6; Request 120–54, Claim Chart CC-D); *see also* Request 120–32 (citing Yee 389–92; Dykes 137, 139–41, 145, Figs. 4, 6; Exs. CC-D, OTH-B, 61:23–25, 104:16–20, 121:1–3, OTH-D, 17:7–9), 152 (citing Dykes 132, 139–40), Claim Chart CC-D 1–11, 24–25 (citing Yee 389–92; Dykes 132, 137, 139–41, 145, Fig. 6; Exs. OTH-B, 61:23–25, 104:16–20, OTH-D, 17:7–9).

We additionally adopt the Examiner's comments in the Action Closing Prosecution directly related to claims 17 and 67. *See* ACP 34–36

(addressing claim 17) (citing Yee 389–92, Fig. 1; Dykes 134–37, 139–42, 145, Figs. 2, 6; Request 122), 52–54 (citing the same) (addressing claim 67). Lastly, claims 17 and 67 are rejected based on the additional findings and conclusion presented above for claim 33 related to similar claim recitations.

As for the arguments presented by Patent Owner, we are not persuaded for the reasons discussed above when addressing claim 33.

3. Claims 6, 18, 34, 35, and 68

Claim 6 depends from canceled claim 1; claim 18 depends from canceled claim 13; claims 34 and 35 depend from canceled claim 21; claim 68 depends from canceled claim 55. Like claim 33, we adopt the findings and conclusions discussed in the Non-Final Office Action and the Request for those limitations in claims 6, 18, 34, 35, and 68 similar to claim 21, from which claim 33 depends, and claim 35. *See* Nov. 2012 Non-Final Act. 11–14 (citing Yee 389–92, Fig. 1; Dykes 132, 136–42, 144–45, Fig. 6; Request 120–54, Claim Chart CC-D); *see also* Request 120–32 (citing Yee 389–92; Dykes 137, 139–41, 145, Figs. 4, 6; Exs. CC-D, OTH-B, 61:23–25, 104:16–20, 121:1–3, OTH-D, 17:7–9), 153–54 (citing Yee 389), Claim Chart CC-D 1–11, 25–26 (citing Yee 389–92; Dykes 137, 139–41, 145, Fig. 6; Exs. OTH-B, 61:23–25, 104:16–20, OTH-D, 17:7–9).

Each of claims 6, 18, 34, 35, and 68 recites "the first and second images are each a composite image"; claims 6, 18, 34, and 68 further recite "wherein each composite image is created based on a first one of the image frames acquired at a first point in the trajectory and a second one of the image frames acquired at a second point in the trajectory"; claim 35 further

recites "wherein each composite image is created by processing pixel data of a plurality of the image frames."

As discussed in Section (III)(A)(2), the phrase "composite image" in claims 6, 18, 34, 35, and 68 means a single image created by combining different image data or by uniting image data and claim 35 requires a single image that may be created by combining or uniting image data from a plurality of image frames at the level of pixel data. As explained below, Yee teaches or suggests these limitations under their ordinary and customary meanings as well as the recitation "each composite image is created based on a first one of the image frames acquired at a first point in the trajectory and a second one of the image frames acquired at a second point in the trajectory" found in claims 6, 18, 34, and 68.

Yee addresses collected data made available with its product. Yee 389. The data includes provided various views, including "curbside view, front and back," "street view, front and back," "real estate view left and right," "real estate and addresss [sic] zoom, 4-view," *and* "composites of them." *Id.* Yee explicitly discloses "composites" (*id.*; *see* RAN 71) and "them" refers back to the other discussed views, including a front and back curbside view, a front and back street view, and a left and right real estate view. Thus, Yee teaches creating "composites" of these various views. For example, a composite may combine or unite image data from (1) the curbside view and the street view or (2) two different street views to produce the disclosed "composite[] of them." Yee 389. Additionally, an ordinarily skilled artisan would have recognized Yee's disclosed "composites" would have involved combining or uniting the noted views at the level of pixel data

in some manner so as to form the composites available to the user in Yee. *See id.*

Patent Owner contends that Yee does not teach the recited feature of claim 6. PO Appeal Br. 23–24. More particularly, Patent Owner discusses that each of the 4-views of Yee is taken from "the same point in the trajectory" and therefore is not from a first and second point in the trajectory as recited. PO Appeal Br. 24; *see* PO Rh'g Request 8 (arguing all the images in Yee "are captured at the same time and from the same location" when created the 4-view image). We are not persuaded.

First, the "composite of them" is *separate* from the "4-view" in Yee. Yee 389 (stating "real estate and addresss [sic] zoon, 4-view; *and* composites of them" (emphasis added)). Second, Patent Owner has not provided persuasive evidence that the 4-view example described in Yee (e.g., "real estate and addresss [sic] zoom, 4-view" (Yee 389)) would include only images at the same point in a trajectory. For example, one skilled in the art would have recognized that (1) the real estate view would be taken at a different point along a path than the address view, (2) a front view would be taken at a different point along a path than left view, and (3) two different street views would be taken at different points along a path. *See id.* Third, Yee teaches acquiring images, not just at the same point, but also at a rate of 30 frames per second as the GeoVan travels as fast as 40–50 miles/hour. *Id.* at 389–392; *see also* 3PR Resp. Br. 18 (citing Yee 389–90). Yee thus illustrates that the van moves to different point along a trajectory (e.g., a path along a street) while acquiring images and thus "each composite image" can be "created based on . . . image frames acquired at" different "points in

the trajectory" as claims 6, 18, 34, and 68 recite. Fourth, Yee states "an ideal transportation data collection system should be able to collect data which will . . . locate items hidden by trees or buildings, looking comprehensively" (Yee 390 (underlining omitted)), further suggesting that the multiple sequence images in Yee are taken at different vantage points in order to obtain more information about hidden objects in a frame/view. *See also* 3PR Resp. Br. 18 (quoting Yee 390).

Turning to the specific discussion of the "4-view" example in Yee, Patent Owner argues this is not "a composite image" as recited. PO Appeal Br. 18 (referring to "Requester's remarks" submitted on August 21, 2013). Patent Owner produces "[a]n example of a Yee's 4-view." *Id.* Yet, as Requester notes, the example illustrated on page 18 of Patent Owner's brief is "neither found in Yee nor Lachinski"[21] and has not been demonstrated to be "an accurate portrayal of the four-view images disclosed in Yee." 3PR Resp. Br. 10. We also cannot locate the produced 4-view example in either Yee or Lachinski, which has been cited by Requester to illustrate how the "4-view" discussed in Yee is created. 3PR Resp. Br. 9–10. Thus, the example provided by Patent Owner fails to demonstrate sufficiently that the images in all of Yee's 4-views would be "clearly delineated by blank spaces" as argued. PO Appeal Br. 18–19.

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[21] Lachinski is a patent issued to GeoSpan Corporation on May 27, 1997. "GeoSpan" and a "4-view" are discussed in Yee. Yee 388–89. Lachinski was introduced in Requester's February 6, 2013 Comments 23 "to explain Yee's teachings and to rebut Patent Owner's mischaracterization of Yee, which was permitted under § 1.948(a)(2)." 3PR Resp. Br. 9.

Nevertheless, some similarities exist between what is shown in Patent Owner's hypothetical example and what Yee and Lachinski disclose. Yee discusses "images can be displaced as rolling video of four views in a frame . . . ." Yee 392. Lachinski further states:

> The four-view generator 62 has four inputs 82, allowing signals from four of the video cameras 50 to be input simultaneously. The generator 62 reduces the image represented by each signal to one-fourth of its original size and then combines the reduced images to form a single video image by placing each of the reduced images into one of the four corners of an output image.

Lachinski 5:25–31, Fig. 3. This supports that the "4-view" discussed in Yee (Yee 389) can include four images, one in each of four corners that is reduced in size. *See* Lachinski 5:25–31, Fig. 3. Lachinski also states the generator produces "a single video image" that includes four reduced size images. *Id*.

Yee teaches and suggests that data from the four images, which includes its pixel data, are used to create the single image frame with reduced-sized images. This "four views in a frame" in Yee (Yee 392) or the "single video image" with four-views, each one-fourth of its original size that form "reduced images," as explained in Lachinski (Lachinski 5:25–31), is a single image frame that is made up of different parts or images (e.g., image data from multiple views) and unites pixel data from each of the different view image frames (e.g., processes image data from image frames at the level of pixel data) into a single image.

Based on the foregoing discussions, Yee teaches or at least suggests two examples (e.g., "composites of them" image and "4-view" image) of "the first and second images are each a composite image, wherein each

composite image is created by processing pixel data of a plurality of the image frames" as claim 35 recites and "each composite image is created based on a first one of the image frames acquired at a first point in the trajectory and a second one of the image frames acquired at a second point in the trajectory" as claims 6, 18, 34, and 68 recite.

Moreover, Dykes teaches and suggests creating images that "are each a composite image" because of the reasons similar to those previously discussed when addressing claim 33. That is, Dykes teaches creating panoramas, which are single images created by combining and uniting different image data (e.g., the nine images in the upper left in Figure 2) through a stitching technique. *See* Dykes 134–36, Fig. 2. Dykes thus illustrates how images taken at different points can be stitched together to yield a single, composite image. *See* RAN 25 (citing Dykes 134–35, Fig. 2); *see also* 3PR Resp. Br. 18 (citing Dyke 135). Moreover, "Patent Owner admits that the panoramas in Dykes are composite images." PO Appeal Br. 19 (stating "Patent Owner admits that the panoramas of Dykes are composite images"). We refer to the previous discussion for more details related to Dykes's teachings for creating panoramas, for a motivation to combine this teaching with Yee, and for Patent Owner's arguments in this regard (PO Appeal Br. 23–24). The rejection therefore relies on both Yee and Dykes's teachings collectively to arrive at the claimed "composite image" of claims 6, 18, 34, 35, and 68. *See* 3PR Resp. Br. 19 (noting Patent Owner attacks Yee and Dykes individually).

Patent Owner argues that Dykes does not teach that the series of images combined to produce a panorama (e.g., a type of composite image)

are acquired from multiple points in the trajectory. PO Appeal Br. 23. As stated previously, the rejection does not rely on Dykes to teach the image acquisition features of the claim or to replace Yee's teaching in this regard. *See* RAN 70; *see also* 3PR Resp. Br. 16. That is, the rejection relies on Yee to acquire the image frames at different points in the trajectory. *See* RAN 24–25 (citing Yee 389–392; Fig. 1). The rejection turns to Dykes specifically for its stitching feature to create the recited "each composite image" that is based on different points in the trajectory as acquired by Yee. *See id.* (citing Dykes 134–135; Fig. 2); *see also* 3PR Resp. Br. 18–20; Aug. 2015 3PR Comments 9 (noting the rejection relies on Yee and Dykes). Thus, whether Dykes obtains images by panning or by any other argued technique (PO Appeal Br. 23; PO Reb.Br. 17–18) is not pertinent to the rejection as proposed, which relies on Yee to teach how the images are acquired.

4. Claims 8, 20, 36, and 70

Claim 8 depends from canceled claim 1; claim 20 depends from canceled claim 13; claim 36 depends from canceled claim 21; claim 70 depends from canceled claim 55. Like claim 33, we adopt the findings and conclusions discussed in the Non-Final Office Action and the Request for those limitations in claims 8, 20, 36, and 70 similar to claim 21, for which claim 33 depends. *See* Nov. 2012 Non-Final Act. 11–14 (citing Yee 389–92, Fig. 1; Dykes 132, 136–42, 144–45, Fig. 6; Request 120–54, Claim Chart CC-D); *see also* Request 120–32 (citing Yee 389–92; Dykes 137, 139–41, 145, Figs. 4, 6; Exs. CC-D, OTH-B, 61:23–25, 104:16–20, 121:1–3,

OTH-D, 17:7–9), Claim Chart CC-D 1–11 (citing Yee 389–92; Dykes 137, 139–41, 145, Fig. 6; Exs. OTH-B, 61:23–25, 104:16–20, OTH-D, 17:7–9).

Each of claims 8, 20, 36, and 70 recites "wherein the first and second images each depict a wider field of view than is depicted in any one of the image frames." For the reasons similar to those discussed above when addressing claims 17, 33, and 67, Dykes teaches it images each depict a wider field of view (e.g., stitched panoramas, such as the one shown in Figure 2) than any one image frame (e.g., frames shown in Figure 2). *See* Dykes 135, Fig. 2. Moreover, Patent Owner admits Dykes discloses images with "wider fields of view." PO Appeal Br. 23 (stating "Patent Owner does not deny that Dykes discloses composite images depicting panoramic views or wider fields of view."). We refer to the previous discussion for more details related to Dykes's teachings for creating panoramas, a motivation to combine this teaching with Yee, and Patent Owner's arguments in this regard (PO Appeal Br. 22–24).

5. Claims 2–5, 9, 10, 14–16, 24, 26, 29, 37, 38, 41, 42, 44–48, 51–54, 56–60, 63–66, 71, and 72

Claims 2–5, 9, and 10 ultimately depend from canceled claim 1; claims 14–16 ultimately depend from canceled claim 13; Claims 24, 26, 29, 37, 38, 41, and 42 ultimately depend from canceled claim 21; claims 44–48 and 51–54 ultimately depend from canceled claim 43; claims 56–60, 63–66, 71, and 72 ultimately depend from canceled claim 55. Like claim 33, we adopt the findings and conclusions discussed in the Non-Final Office Action and the Request for those limitations in claims 2–5, 9, 10, 14–16, 37, 38, 41, 42, 46–48, 51–54, 56–60, 63–66, 71, and 72 similar to claim 21 from which

claim 33 depends. *See* Nov. 2012 Non-Final Act. 11–14 (citing Yee 389–92, Fig. 1; Dykes 132, 136–42, 144–45, Fig. 6; Request 120–54, Claim Chart CC-D); *see also* Request 120–32 (citing Yee 389–92; Dykes 137, 139–41, 145, Figs. 4, 6; Exs. CC-D, OTH-B, 61:23–25, 104:16–20, 121:1–3, OTH-D, 17:7–9), , Claim Chart CC-D 1–11 (citing Yee 389–92; Dykes 137, 139–41, 145, Fig. 6; Exs. OTH-B, 61:23–25, 104:16–20, OTH-D, 17:7–9).

Regarding claim 2, we further adopt the findings and conclusion presented in the Action Closing Prosecution. *See* ACP 17–18 (citing Yee 389–92, Fig. 1; Dykes 136–37, 139–42, 145, 147). Regarding claims 3, 14, 44, and 56, we further adopt the findings and conclusions presented in (1) the Non-Final Office Action and Request related to canceled claim 22 (Non-Final Act. 13 (citing Dykes 137, 139–41, 144–45, Figs. 4, 6); Request 132–35 (citing Dykes 137, 139–41, Figs. 4, 6; Ex. CC-D)), (2) the Action Closing Prosecution for claims 3, 14, and 56 (ACP 19–20 (citing Yee 389–92, Fig. 1; Dykes 134, 136–37, 139–42, 145, 147, Fig. 6), 29–31 (same), 41–43 (same)), and (3) Requester's cross appeal (3PR Appeal Br. 25–26 (citing Dykes 137, Fig. 6)). Regarding claims 4, 15, 45, and 57, we further adopt the findings and conclusions presented in (1) the Non-Final Office Action and Request related to canceled claim 23 (Non-Final Act. 13 (citing Dykes 137–41); Request 135–38 (citing Dykes 137–41, 144–45, Fig. 4; Ex. CC-D, OTH-B, 59:18–19)) (2) the Action Closing Prosecution for claims 4 and 57 (ACP 21 (citing Dykes 137–41), 31 (same), 43 (same)), and (3) Requester's cross appeal (3PR Appeal Br. 26–27 (citing Dykes 137, 139, 144; Sections VIII.B.2–3, and Subsection 2)). Regarding claims 5, 16, 24, 46, and 58, we further adopt the findings and conclusions presented in (1) the Action

Closing Prosecution for claim 5 (ACP 21–22 (citing Dykes 137, 139–42, 145), 32 (same), 43–45 (same)) and (2) Requester's cross appeal (3PR Appeal Br. 16–17 (citing Dykes 137), 27 (citing Section VIII.B.2 for claim 24)). Moreover, Dykes shows "a direction identifier" as arrows in its figures. *See* Dykes, Figs. 4, 6.

Regarding claims 9, 37, and 71, we further adopt the findings and conclusions presented in the Action Closing Prosecution (ACP 27–29 (citing 389–92, Fig. 1; Dykes 134, 137, 139–42, 145, Fig. 6; Request 122), 58–60 (same)) and by Requester in its cross-appeal (3PR Appeal Br. 22–23 (citing Yee 389; Dykes 129, 144, 146)). Moreover, Yee discusses Global Positioning System (GPS) and Geographic Information Systems working with video technology (Yee 388), its system is capable of obtaining accurate GPS positioning (*id.* at 390), and collecting and synchronizing images (*id.* at 391). Additionally, Dykes's Figure 2 and its stitching technique suggests that the acquired image frames (e.g., the nine frames in the upper-left side) are synchronized with some form of position information in order to create the continuous panorama that is properly aligned as shown in Figure 2. *See* Dykes 135, 137, Fig. 2. Combining Yee's GPS positioning/synchronizing image approach with Dykes's technique to unite (e.g., synchronized) images based on position would have assisted in and improved upon producing the continuous image (e.g., a panorama) in Dykes by using the Yee's positioning data. *See KSR*, 550 U.S. at 417

Regarding claims 10, 38, and 72, we further adopt the findings and conclusions presented in the Action Closing Prosecution (ACP 29 (referring

to claim 9), 60 (referring to claim 71)) and by Requester in its cross-appeal (3PR Appeal Br. 23–24 (citing Yee 392; Dykes 144)).

Regarding claims 26, 48 and 60, we further adopt the Requester's findings and conclusions. 3PR Appeal Br. 17 (citing Dykes 139), 28 (stating "Dykes discloses this limitation for the same reasons discussed in Section VIII.B.3 for Claim 26"). In particular, Dykes teaches hot-linked or interactive symbols (e.g., "displaying a navigation button") that can be clicked to display images (e.g., "receiving user selection of the navigation button"). Dykes 137, 139, 141, Fig. 4. Dykes also teaches the symbols are included "within panoramas that display the appropriate image when clicked" (*id.* at 139), and "the map identif[ies] the locations of panoramas, and reveal the view and angle of view when clicked" (*id.* at 140). Thus, when a user clicks on the symbol at location as taught in Dykes to view a panorama and then clicks on another symbol (e.g., an interactive symbol near an arrow to the right or left of the first's location center) within the panorama, Dykes teaches or suggests a symbol can show its direction relative to its location using further arrows (*see id.* at 139, 141 (*see* arrows within middle and bottom panoramas in Figure 4)) and further that a section of a panoramic image can be viewed by moving left or right (*see id.* at 137–39, Fig. 3) or "clockwise from [the] north" (*id.* at 139) (e.g., "a navigation direction"). Dykes' teachings, when combined with Yee, thus teach and suggest "receiving user selection of the navigation button" as claimed.

Regarding claims 29, 51, and 63, we further adopt the findings and conclusions presented by Requester in its cross-appeal (3PR Appeal Br. 18

(citing Dykes 139), 28 (referring claim 29 and Section VIII.B.4), 31–32 (same)).

Regarding claim 41, we further adopt the findings and conclusions presented by Requester in its cross-appeal (3PR Appeal Br. 24 (citing Dykes 145)). Moreover, Yee also teaches its system has a database containing infrastructure, street details, and data. Yee 388. Using a database to perform the process of claim 21, from which claim 41 depends, at least suggests to an ordinarily skilled artisan that the recited "one or more computer devices includes a server" consistent with the Specification. *See* the '025 patent, 4:40 (discussing a "database server").

As for claim 42, we refer to the discussion of limitations found in canceled claims 1 and 13, both of which include recitations to "a user terminal" similar to the "one or more computer devices includes a user terminal" recited in claim 42. *See, e.g.*, ACP 17 (discussing "a user terminal") (citing Yee 391–92), 29–30 (same). We further adopt Requester's discussion of claim 42. 3PR Appeal Br. 24–25 (citing Yee 391–92).

Regarding claims 47 and 59, we further adopt the Requester's findings and conclusions related to Yee. 3PR Appeal Br. 27–28 (citing Yee 392) (referring to Subsections 4 and 7). Specifically, Yee teaches a user can point to a road segment or specific location on a computerized map to view an image and the user can provide a "[s]treet address entry" to "retrieve house images as every house is individually tagged with its address." Yee 392. As such, Yee teaches and suggests a "location specified by the first user input is an address specifying information selected from the group

consisting of street name, city, state, and zip code" as claims 47 and 59 recite.

Regarding claims 52 and 64, these claims are similar in scope to canceled claim 30. We thus further adopt the Examiner's findings and conclusions in the Request and the Non-Final Office Action related to claim 30 and in the Action Closing Prosecution related to claim 64. *See* Request 175–78 (citing Dykes 137, 139–41, 144–45, Figs. 4, 6; Ex. OTH-B 61:23–25); *see also* Non-Final Act. 13–14 (citing Dykes 137, 139–40, 144–45, Figs. 4, 6; Ex. CC-D); ACP 49–51 (citing Yee 389–92; Dykes 134, 136–37, 139–41, 142, 145, Fig. 6; Request 122).

Regarding claims 53, 54, 65, and 66, these claims are similar in scope to one of canceled claims 31 or 32. We thus further adopt the Examiner's findings and conclusions in the Request and the Non-Final Office Action related to claim 32 and the Action Closing Prosecution related to claims 65 and 66 that Dykes teaches "displaying a map of at least a portion of the geographic area, wherein the direction identifier is displayed on the map" as recited. *See* Request 178–84 (citing Dykes 134, 139–41, 142, 144–45, Fig. 6; OTH-B 59:18–19, 61:23–25); *see also* Non-Final Act. 13–14 (citing Dykes 137, 139–40, 144–45, Figs. 4, 6; Ex. CC-D); ACP 51–52 (citing Dykes 137–41, 144–45, Fig. 6; Request 122). Moreover, as previously noted, Dykes teaches displaying symbols, which include both dots (e.g., "a location identifier" as claims 53 and 65 recite) and arrows (e.g., "a direction identifier" as canceled claims 43 and 55 recited) on a map. Dykes 139–41, 145, Figs. 4, 6. Dykes also teaches multiple symbols can be located within a map (*see id.* at 141, 145, Figs. 4, 6), further suggesting "displaying on the

map a location identifier" on the displayed map as claims 53 and 65 recite and "retrieving from the image source a third image associated with the selected location on the map" and "displaying the third image on the display screen" as claims 54 and 66 recite.

For each of the above-discussed claims, we additionally refer to our previous discussion addressing reasons to combine Yee and Dykes.

In summary, pursuant to 37 C.F.R. § 41.77(b), claims 2–6, 8–10, 14–18, 20, 24, 26, 29, 33–38, 41, 42, 44–48, 51–54, 56–60, 63–68, and 70–72 are rejected under 35 U.S.C. § 103(a) based on Yee and Dykes.

IV. REQUESTER'S CROSS APPEAL

Requester appeals the Examiner's confirmation of claim 28 and the ultimate conclusion that claims 24, 26, 28, 29, 37, 38, 41, 42, 44–48, 51–54, and 63 are patentable. 3PR Appeal Br. 2; RAN 1. Requester argues that claims 24, 26, 28, and 29 should be rejected based on Ishida and Dykes and claims 37, 38, 41, 42, 44–48, 51–54, and 63 should be rejected based on Ishida, Dykes, and Yee. 3PR Appeal Br. 11–32.

Ishida, Dykes, and Yee

Pursuant to 37 C.F.R. § 41.77(b), we present a new ground of rejection for claims 28, 29, 51, and 63 under 35 U.S.C. § 103(a) based on Ishida, Dykes, and Yee. Each of claims 28 and 29 ultimately depends from canceled claim 21; claim 51 ultimately depends from canceled claim 43; claim 63 ultimately depends from canceled claim 55. Thus, each of claims 28 and 29 includes the limitations found in canceled claim 21; claim 51

includes the limitations found in canceled claim 43; claim 63 includes the limitations found in canceled claim 55.

A. Claim 28

Claim 28 recites "[t]he method of claim 27, wherein the particular one of the objects is a retail establishment, the method further comprising: accessing a web page for the retail establishment; and invoking by the computer system a display of the web page on the display screen" (the Web Page Limitations). Claim 27 has been canceled and depends from canceled claim 21.

We adopt Requester's discussion of claim 28 under 35 U.S.C. § 103 based on Ishida and Dykes in the Request, the August 2013 Comments, and the Requester's Appeal Brief. Request 154–65 (citing Ishida 25–27, 34, Figs. 1, 3; Dykes 137, 139–41, 145–46, Fig. 6; Ex. OTH-B 104:16–20,106; Ex. CC-E), 171–174 (citing Ishida 30–31; Dykes 139, 144–45, Fig. 6; Ex. OTH-B 59:18–19, 61:23–25, 106; Ex. OTH-D 17:7–9; Ex. CC-E); *see also* Aug. 2013 3PR Comments 12–16 (citing Dykes 127, 137, 139–42, 146, Abstract; Ishida 3, 6–8[22]); 3PR Appeal Br. 11–16 (citing Request 156–65, 173, 174; Ishida 25, 29–30; Dykes 1237, 137, 139–42, 146, Abstract, Figs. 4, 6). We further rely on the additional teachings and conclusions of (1) Yee and (2) Dykes as previously discussed when addressing canceled claim 21

[22] Requester refers to the pages in Ishida differently in (a) its appeal brief and August 2013 Comments and (b) the Request. *Compare* 3PR Appeal Br. 15 (citing Ishida 3), *with* Request 156–57 (quoting Ishida 25–27). We use similar page numbering to the Request. For example, in the above citation, pages 3 and 6–8 cited in the August 2013 Comments are pages 25, 28–30 in the Request.

under the rejection based on Yee and Dykes. *See, e.g.*, Yee 389–92, Fig. 1; *see also* Dykes 141, Fig. 4.

The Examiner initially adopted, but later withdrew, this rejection. ACP 61–63, 66; RAN 62–64, 67.

Concerning the Web Page Limitations (*see* Section (III)(A)(3)), Requester contends that Ishida provides web information "as part of the virtual tourist experience that allows users to access the geographically indexed websites, such as to determine the availability of restaurant tables available for dining." 3PR Appeal Br. 15; *see id.* at 3 (stating "Ishida teaches enabling user access to store websites, such as to determine the availability of restaurant tables available for dining"). Requester states, under the proposed construction, Ishida's website access teaches the Web Page Limitations. *See id.* at 15–16. Requester argues that Ishida teaches registering web pages, dynamically integrating WEB archives from various companies (e.g., parking lot availability or restaurant table availability), and retrieving WEB retrieval of real-time data. *See id.*; *see also* 3PR Rh'g Request 3–12. Requester further contends Ishida teaches web retrieval of data and displaying them to the user and that "[i]t is common knowledge that web pages are retrieved and displayed to users on a computer system's screen." 3PR Appeal Br. 16. Requester concludes that an ordinarily skilled artisan would have understood that Ishida teaches the recitation, "invoking by the computer system a display of the web page on the display screen" as claim 28 recites. *Id.*

Patent Owner argues Ishida does not disclose the Web Page Limitations. Aug. 2015 PO Comments 9–16. Specifically, Patent Owner

argues that Ishida does not indicate clearly whether it "displays the actual web pages registered by its users" (*id.* at 11) or the retail establishment's web page, but rather obtains information from a web page to present in a map. *See id.* at 11–13.

As discussed above in Section (III)(A)(3), we understand the phrase "web page for the retail establishment" to include a web page (1) that shows particular information about the retail establishment (e.g., online Yellow Pages directory) or (2) associated with a particular retail establishment. *See Vederi*, 813 F. App'x at 505. Ishida teaches a social information infrastructure for a city (e.g., Kyoto) that includes shopping, business, transportation, education, and other information. *See* Ishida 23–24, Abstract. This structure integrates both World Wide Web archives and real-time information related to the city into WEB and ftp interface (e.g., the interface or second layer) on the Internet. *See id.* at 23–25, 28; *see* 3PR Rh'g Request 8–9 (discussing Ishida's three-layer model) (citing Ishida 24–25, Fig. 1).

Specifically, Ishida's Section 4 indicates the digital city integrates WEB and sensory data on a map, which involves registering WEB pages with the digital city, determining the XY coordinate of each WEB page, and retrieving WEB pages. Ishida 28–30; *see* 3PR Appeal Br. 15 (quoting Ishida 25). As an example, sensors in Kyoto gather traffic data from buses that send location and route data to the live digital city, and WEB pages for bus stops are retrieved and displayed so that real-time bus data is displayed on the map of Kyoto. *See* Ishida 29–30, Fig. 5(b); *see* 3PR Rh'g Request 11 (reproducing Ishida, Figs 5(a)–(b)). As such, each of these web pages in

Ishida (e.g., WEB and ftp interface) shows particular information (e.g., bus data) about or associated with a retail establishment (e.g., a transportation company having a bus stop).

Ishida therefore teaches or suggests "the particular one of the objects is a retail establishment" (e.g., a bus stop in geographic area,[23] like Kyoto), "accessing a web page for the retail establishment" (e.g., Kyoto's or the digital city's WEB/ftp interface that contains web page information for the transportation company's bus stop) and "invoking by the computer system a display of the web page on the display screen" (e.g., displaying the Kyoto bus stop's real-time information using the WEB/ftp interface) as claim 28 recites. To the extent that a transportation company's bus stop is not viewed as "a retail establishment," Ishida also teaches its interface retrieves data related to traffic, weather, parking, shopping, and sightseeing (*id.* at 24), which include information concerning parking lots (e.g., the nearest parking lot), restaurant tables (e.g., whether one can reserve a table at a restaurant), and shopping (e.g., what is on sale at a department store). *See id.* at 24, 30; *see* 3PR Appeal Br. 15–16 (citing Ishida). Although Ishida further notes that information related to parking lots and restaurants are expected in the future (*id.* at 30), these teachings in Ishida at a minimum suggest "a web page for the retail establishment" recitations in claim 28 as construed in Section (III)(A)(3).

Requester further relies on common knowledge in concluding that "web pages are retrieved and displayed to users on a computer system's

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[23] Claim 21, from which claim 28 depends, recites "a plurality of images depicting views of objects in the geographic area." The '025 patent, 17:48–49.

screen." 3PR Appeal Br. 16. Based on this common knowledge, Requester argues, and we adopt, that an ordinarily skilled artisan would have understood Ishida's discussions of "'WEB retrieval' of 'real-time data' and displaying them to the users" (*id.* (quoting Ishida 30)) teaches the recited "invoking by the computer system a display of the web page on the display screen" as claim 28 recites. *Id.*; *see also* 3PR Rh'g Request 11–12.

Patent Owner argues Ishida does not disclose "accessing a web page for the retail establishment; and invoking by the computer system a display of the web page on the display screen" as recited because Ishida merely updates photos on buildings using a WEB and ftp interface. PO Rh'g Request 10 (quoting Ishida 27–28); *see* Aug. 2015 PO Comments 9–10, 14. Patent Owner further argues Ishida does not teach the above limitation even if the language includes "displaying information relating to the retailer." Aug. 2015 PO Comments 13–14. For the above reasons, we are not persuaded.

Patent Owner also contends that Ishida does not clearly teach "display[ing] the actual web pages registered by the users" but rather merely obtaining information from a web page and presenting the information within a map. *Id.* at 11 (quoting Ishida 28); *see id.* at 11–14. This argument is not persuasive. Based on the court's construction of "web page for a retail establishment," the actual web page registered by the user need not be displayed when "invoking . . . a display of the web page on the display screen" as recited. That is, the recited "web page for the retail establishment" in claim 28 is not limited to "one that is owned or operated by the retail establishment" (*Vederi*, 813 F. App'x at 504–505) but rather

includes a web page that either shows particular information about the retail establishment or is associated with a particular retail establishment. *Id.* at 505. As previously explained, Ishida's WEB interface generates a digital city (e.g., a web page) that integrates WEB data from WEB pages and sensory data on a map about or associated with a retail establishment (e.g., a company's bus stop, parking lot, or restaurant) (Ishida 28–30) and thus "invok[es] . . . a display of the web page [for the retail establishment] on the display screen" as claim 28 recites.

Patent Owner notes Ishida states "WEB retrieval under the constraint of sensory data is definitely an interesting research issue" (Ishida 30). Aug. 2015 PO Comments 13. For this reason, Patent Owner argues the cited portion of Ishida "is speculative." *Id.* We are not persuaded. As noted above, Ishida explicitly teaches and shows retrieving data from web pages and sensory data. Ishida 29, Figs. 5(a)–(b). As such, Ishida does not just speculate or propose retrieving data as a research topic but rather actually shows an example of retrieving web and sensory data within a web interface. *See id.* at 23, 25–26, 28.

Regarding the Image Frames Limitations (*see* Section (II)(A)(1)) in claim 21, from which claim 28 ultimately depends, Requester states that Dykes teaches "the images . . . may be taken by students as they travel from one location to another." Request 159 (quoting Dykes 146); *see id.* at 160 (same); 3PR Appeal Br. 14 (citing Dykes 146). For the first time in its rebuttal brief, Patent Owner asserts Dykes does not appear to disclose the images are captured while its image recording device is in motion. PO Reb. Br. 13–14 (quoting Dykes 134), 19. Patent Owner further states Ishida does

not teach the Image Frames Limitations because "Ishida merely appears to disclose developing a three-dimensional model of a city (see, e.g., p. 27 of Ishida)." *Id.* at 19.

In Section (III)(A)(1), we found the Image Frames Limitation requires the image recording device moves along a path, course or route and that the image recording device acquires images associated with image frames (1) while moving or (2) both while moving and while stationary as long as some images are associated with image frames acquired while the image recording device is moving. Requester cites to Ishida and Dykes to teach "providing by the image source a plurality of images depicting views of objects in the geographic area" and "wherein the images are associated with image frames acquired by an image recording device moving along a trajectory" limitations respectively. Request 157–58 (citing Ishida 27), 159–60 (citing Dykes 146).

Ishida's digital city (e.g., Kyoto) interface can be built from 3D Web technology that integrates photos mapped onto 3D blocks and 2D planes to create a realistic 3DML (three-dimensional modeling language) space. Ishida 26–27, *cited in* Request 157. Ishida is silent regarding how its photos are obtained. Dykes provides a little more detail about how its images are obtained. Dykes 146, *cited in* Request 159–60. Specifically, Dykes teaches students record images using a digital camera and obtain images at selected locations along a footpath's slope. *Id.*; *see id.* at 134 (discussing digital cameras capturing images). Yet, Dykes also does not disclose whether or not these images can be obtained by the digital camera (e.g., an image

recording device) (1) while moving or (2) both while moving and while stationary.

As previously discussed, Yee teaches a known technique for obtaining image frames using cameras located on a van that moves along a road (e.g., image frames acquired by an image recording device moving along a trajectory) to ensure no object is lost behind an obstruction for example. *See* Yee 388–90. Given Ishida's interest to obtain images of a city realistically and to diminish modeling problems (Ishida 26–27), Yee provides a solution that collects images completely and accurately for Ishida's digital city interface. Yee further discusses its system has accurate GPS three-dimensional positioning to ensure accuracy and completeness of the data collected. Yee 390. This teaching in Yee further assists Ishida's process of determining coordinates for images associated with WEB pages that are part of Ishida' digital city interface. *See* Ishida 29.

Patent Owner also argues Ishida when combined with Dykes and Yee[24] does not disclose "a user selection associated with a particular one of the objects depicted in the first image" as claim 28 recites due to its dependency on claim 27 (not reexamined). Aug. 2015 PO Comments 15. We disagree. The Request proposed that Dykes teaches this feature when a user clicks on hot-linked symbols representing spots or locations (e.g., objects) within an image (e.g., a panorama), and an appropriate image is displayed. Request 171–73 (citing Dykes 139, 144); *see* Dykes 141, 145, Figs. 4, 6. Moreover, as explained above, "one of the object" as recited in

[24] Patent Owner mistakenly refers to "Yes" instead of Yee. Aug. 2015 PO Comments 15.

claim 27 and "the particular one of the objects" recited in claim 28 can be a company's bus stop, parking lot, or restaurant as taught or suggested by Ishida. When combined, Ishida and Dykes teach or suggest a user selection can be associated with a particular one of the objects depicted in the first image. Also, as discussed above, Yee also teaches its interface allows a user to point at a road segment or specific location on a map and then display images related to the segment or location. *See* Yee 391–92. Thus, when combined, Ishida, Dykes, and Yee teach or suggest a user selection can be "associated with a particular one of the objects depicted in the first image" as claim 28 recites due to its dependency on claim 27.

Upon review of the record, we adopt Requester's finding and conclusions related to claim 28 as our own.

B. Claims 29, 51, and 63

Claim 29 ultimately depends from canceled claim 21 and recites "invoking by the computer system a display of an icon in association with the particular one of the objects, wherein the user selection is actuation of the icon." Claims 51 ultimately depends from canceled claim 43; claim 63 ultimately depends from canceled claim 55. Claims 51 and 63 recite similar limitations to claim 29.

For each of these claims, we adopt Requester's findings and conclusions how Ishida, Dykes, and Yee teach or suggest the recitations in these claims. 3PR Appeal Br. 18 (citing Dykes 139), 20 (citing "Section VIII.B.1 of the August Comments"; Request 154–156; Lachinski 2:47–50, 3:32–37, 9:42–46, 12:52–65, 13:56–63, 16:40–50), 28 (referring to claim 29, Section VIII.B.4, and Subsection 7). Claim 63 ultimately depends from

canceled claim 55. We adopt Requester's findings and conclusions how Ishida, Dykes, and Yee teach or suggest the recitations in these claims. 3PR Appeal Br. 31–32 (referring to claims 55 and 61) (citing Request 122–32, 148–49; Sections VIII.B.1 and Section VIII.B.4).

Also, Ishida teaches including moving objects, such as cars, buses, and trains (e.g., "display of an icon in association with the particular one of the objects" depicted in an image), within its interface layer having 2D maps and 3D virtual spaces and that these objects can be clicked to communicate with it (e.g., "the user selection is actuation of the icon"). Ishida 25. When combined with Dykes teachings to display symbols associated with objects in the geographic area, the combined method would have predictably yielded the step of "invoking by the computer system a display of an icon in association with the particular one of the objects, wherein the user selection is actuation of the icon" as claims 29, 51, and 63 recite.

Patent Owner did not file a respondent brief to address Requester's appeal and the proposed rejection. Other than discussing claim 28, Patent Owner does not discuss the above claims in its comments to Requester's rehearing request. *See generally* Aug. 2015 PO Comments (addressing the Web Page Limitations).

Upon review of the record, we adopt Requester's finding and conclusions related to claims 29, 51, and 63 as our own.

C. Remaining Claims Appealed

Above, we rejected patent claims 24, 26, 37, 38, 41, 42, 44–48, and 52–54 based on Yee and Dykes. Thus, the above discussions address all the claims on appeal and are dispositive, rendering it unnecessary to reach the

propriety of any remaining contentions. *See Beloit Corp. v. Valmet Oy*, 742 F.2d 1421, 1423 (Fed. Cir. 1984); *see also Vivid Techs., Inc. v. Am. Sci. & Eng'g, Inc.*, 200 F.3d 795, 803 (Fed. Cir. 1999).

V. CONCLUSION

We have reviewed the entire record, including submissions by Patent Owner and Requester and the decision in *Vederi*. Concerning the claims rejected by the Examiner, we determine:

Claims Rejected	35 U.S.C. §	Reference(s) /Basis	Affirmed	Reversed	New Ground
2–6, 8–10, 14–18, 20, 33–36, 56–60, 64–68, 70–72	103(a)	Yee, Dykes		2–6, 8–10, 14–18, 20, 33–36, 56–60, 64–68, 70–72	2–6, 8–10, 14–18, 20, 33–36, 56–60, 64–68, 70–72

Concerning the claims the Examiner either confirmed or found patentable, we conclude:

Claims Not Rejected	35 U.S.C. §	Reference(s)/Basis	Affirmed	Reversed	New Ground
24, 26, 28, 29, 37, 38, 41, 42, 44–48, 51–54, 63				24, 26, 28, 29, 37, 38, 41, 42, 44–48, 51–54, 63	
24, 26, 29, 37,	103(a)	Yee, Dykes			24, 26, 28, 37,

38, 41, 42, 44–48, 51–54, 63					38, 41, 42, 44–48, 51–54, 63
28, 29, 51, 63	103(a)	Ishida, Dykes, Yee			28, 29, 51, 63
Overall Outcome					2–6, 8–10, 14–18, 20, 24, 26, 28, 29, 33–38, 41, 42, 44–48, 51–54, 56–60, 63–68, 70–72

VI. TIME PERIOD FOR RESPONSE

This decision contains a new ground of rejection pursuant to 37 C.F.R. § 41.77(b). Section 41.77(b) provides "a new ground of rejection pursuant to this paragraph shall not be considered final for judicial review."

Section 41.77(b) also provides that Patent Owner, within one month from the date of the decision, must exercise one of the following two options with respect to the new ground of rejection to avoid termination of the appeal proceeding as to the rejected claims:

> (1) *Reopen prosecution*. The owner may file a response requesting reopening of prosecution before the examiner. Such a response must be either an amendment of the claims so rejected or new evidence relating to the claims so rejected, or both.

> (2) *Request rehearing*. The owner may request that the proceeding be reheard under § 41.79 by the Board upon the same record. The request for rehearing must address any new ground of rejection and state with particularity the points believed to have been misapprehended or overlooked in entering the new ground of rejection and also state all other grounds upon which rehearing is sought.

In accordance with 37 C.F.R. § 41.79(a)(1), the "[p]arties to the appeal may file a request for rehearing of the decision within one month of the date of: . . . [t]he original decision of the Board under § 41.77(a)." A request for rehearing must be in compliance with 37 C.F.R. § 41.79(b). Comments in opposition to the request and additional requests for rehearing must be in accordance with 37 C.F.R. § 41.79(c)–(d), respectively. Under 37 C.F.R. § 41.79(e), "[t]he times for requesting rehearing under paragraph (a) of this section, for requesting further rehearing under paragraph (c) of this section, and for submitting comments under paragraph (b) of this section may not be extended."

An appeal to the United States Court of Appeals for the Federal Circuit under 35 U.S.C. §§ 141–144 and 315 and 37 C.F.R. § 1.983 for an *inter partes* reexamination proceeding "commenced" on or after November 2, 2002 may not be taken "until all parties' rights to request rehearing have been exhausted, at which time the decision of the Board is final and appealable by any party to the appeal to the Board." 37 C.F.R. § 41.81; *see also* MPEP §§ 2682, 2683.

No time period for taking any subsequent action in connection with this appeal may be extended under 37 C.F.R. § 1.136(a).

Requests for extensions of time in this proceeding are governed by 37 C.F.R. §§ 1.956 and 41.79(e).

In the event neither party files a request for rehearing within the time provided in 37 C.F.R. § 41.79, and this decision becomes final and appealable under 37 C.F.R. § 41.81, a party seeking judicial review must timely serve notice on the Director of the United States Patent and Trademark Office. *See* 37 C.F.R. §§ 90.1 and 1.983.

<u>REVERSED</u>
<u>37 C.F.R. § 41.77</u>

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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

PTOL-90A (Rev. 04/07)

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

GOOGLE INC.
Requester,

v.

Patent of VEDERI, LLC
Patent Owner

Appeal 2016-006116
Reexamination Control 95/000,682
Patent 7,239,760 B2
Technology Center 3900

Before DENISE M. POTHIER, ERIC B. CHEN, and IRVIN E. BRANCH, *Administrative Patent Judges*.

POTHIER, *Administrative Patent Judge*.

DECISION ON APPEAL

I. STATEMENT OF CASE

This proceeding returns to us on remand from the Court of Appeals for the Federal Circuit ("Federal Circuit"), vacating our previous decisions for this proceeding mailed June 26, 2015,[1] July 16, 2015 ("Errata"[2]), and

[1] At the time of this decision, the Appeal Number was 2015-004309.
[2] The Board supplemented the original Opinion, clarifying that "[w]e reverse the Examiner's decision to confirm claim 8 and conclude claims 2, 3, 12–18,

September 27, 2016. *See Vederi, LLC v. Google LLC*, 813 F. App'x 499, 501 (Fed. Cir. 2020).

As background, Requester requested an *inter partes* reexamination of U.S. Patent No. 7,239,760 B2 ("the '760 patent"). The '760 patent claims priority to U.S. Application 09/758,717 (now U.S. Patent No. 6,895,126 B2), filed on January 11, 2001. *Id.*, code (62). Pursuant to 35 U.S.C. § 154(a)(2), the term of the '760 patent ended twenty (20) years from the filing date (i.e., January 11, 2001) of the earliest application (i.e., U.S. Application No. 09/758,717) for which a benefit is claimed under 35 U.S.C. §§ 120 and 121. *See* 35 U.S.C. § 154(a)(2) (2013); *see also* the Manual of Patent Examining Procedure (MPEP) § 2701(I). Thus, the '760 patent expired on January 11, 2021.[3]

"No amendment may be proposed for entry in an expired patent." 37 C.F.R. § 1.530(j); *see also* 37 C.F.R. § 1.121(j) (referring to § 1.530). That is, "[a]lthough the Office actions will treat proposed amendments [during a reexamination proceeding] as though they have been entered, the proposed amendments will not be effective until the reexamination certificate is issued and published." 37 C.F.R. § 1.530(k). Notably, "no amendment, other than the cancellation of claims, will be incorporated into the patent by a certificate issued after the expiration of the patent." 37

21–26, 29, 32–37, 39–44, and 46–50 are unpatentable based on Shiffer and Yee." Errata 2.

[3] The MPEP states the Office should "refuse to express to any person any opinion as to . . . the expiration date of any patent, *except to the extent necessary to carry out*: . . . (C) a . . . *reexamination proceeding to reexamine the patent.*" MPEP § 1701 (9th ed. rev. 10.2019 June 2020) (emphases added).

C.F.R. § 1.530(j).

Accordingly, the reexamination proceeding will now be based on the original patent claims of the ’760 patent. Although Patent Owner submitted proposed amendments (*see, e.g.*, the January 8, 2013 Amendment (“Jan. 2013 Amendment”) to the claims during this reexamination proceeding, these proposed amendments, including new claims 39–50 (*id.* at 10–12), are improper at this time. *See* MPEP § 2666.01. On the other hand and even though the ’760 patent has expired, Patent Owner’s proposed claim amendments to cancel claim (i.e., claims 1, 4, 5, 7, 20, and 38 (*see* the Jan. 2013 Amendment 4, 7, 10)) are permitted. *See* MPEP § 2666.01; 37 C.F.R. § 1.530(j). Additionally, claims 6, 9–11, 19, 27, 28, 30, and 31 are not subject to reexamination. *See* RAN 1 (box 1b).[4] Based on the foregoing, the reexamination proceeding will be based on original patent claims 2, 3, 8, 12–18, 21–26, 29, and 32–37.

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[4] Throughout this Opinion, we refer to: (1) Requester’s Appeal Brief (Appeal Br.) filed December 23, 2013, (2) the Examiner’s Answer (Ans.) mailed July 9, 2014, (3) Patent Owner’s Request to Reopen Prosecution Under 37 C.F.R. § 41.77(b)(1) (PO Reopen Request) filed July 27, 2015, (4) Requester’s Comments in Opposition to Patent Owner’s Request to Reopen Prosecution (Aug. 2015 3PR Comments) filed August 27, 2015, (5) the Examiner’s Determination (Ex. Deter.) mailed January 8, 2016, (6) Patent Owner’s Comments Under 37 C.F.R. § 41.77(d) (PO Comments) filed February 8, 2016, (7) Requester’s Comments Under 37 C.F.R. § 41.77(e) (Feb. 2016 3PR Comments) filed February 8, 2016, (8) Patent Owner’s Reply Under 37 C.F.R. § 41.77(e) to Requester’s Comments (PO Reply) filed March 8, 2016, (9) Requester’s Reply Under 37 C.F.R. § 41.77(e) to Patent Owner’s Comments (3PR Reply) filed March 8, 2016, (10) the Action Closing Prosecution (ACP) mailed June 21, 2013, and (11) the Right of Notice Appeal (RAN) mailed September 24, 2013.

Upon review, we REVERSE the Examiner's decision not to reject patent claims 2, 3, 8, 12–18, 21–26, 29, and 32–37 and present new grounds of rejection for these claims pursuant to 37 C.F.R. § 41.77(b).

Related Matters

Requester indicates that the '760 patent is the subject to the following litigation: *Vederi, LLC v. Google Inc.*, Civil No. 2:10-CV-07747 AK-CW (C.D. Cal.), *Vederi, LLC v. Google Inc.*, Case No. 13-1057 (Fed. Cir.), and *Vederi, LLC v. Google Inc.*, Case No. 13-1296 (Fed. Cir.).[5] Appeal Br. 1, 47 (Related Proceedings App.). Additionally, Requester indicates that this appeal may be related to U.S. Patent No. 7,805,025 B2 ("the '025 patent"), which is the subject of *inter partes* reexamination assigned Control No. 95/000,681 and which is a continuation of the '760 patent. *Id.* at 1. The opinions in the proceeding for Control No. 95/000,681 were similarly vacated in *Vederi*. *Vederi*, 813 F. App'x at 501.

Parties Appeals

Requester appealed the decision in the Right of Appeal Notice confirming or finding claims 2, 3, 8, 12–18, 21–26, 29, and 32–37 patentable. Appeal Br. 1, 4.

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[5] Cases Nos. 13-1057 and 13-1296 were decided on March 14, 2014 and concerned U.S. Patent Nos. 7,239,760, 7,577,316, 7,805,025, and 7,813,596. *Vederi, LLC v. Google Inc.*, 744 F.3d 1376 (Fed. Cir. 2014), *rh'g en banc denied.* The Federal Circuit reversed the claim construction of the district court, vacated the judgement, and remanded for further proceedings. *See id.* at 1384. The disputed claim language in the noted opinion differs from the instant appeal.

The Examiner's Answer relied on the RAN, incorporating it by reference. *See* Ans. 1.

An oral hearing was conducted on May 13, 2015. The transcript of the hearing has been made of record.

Another panel[6] at the Patent Trial and Appeal Board reversed Examiner's decision not to reject claims 2, 3, 8, 12–18, 21–26, 29, and 32–37. June 2015 Opinion 16 (vacated); Errata 2 (vacated). The panel presented new grounds of rejection for these claims. *Id.*

Patent Owner requested the proceeding be reopened. *See generally* PO Reopen Request ("the Request"). The proceeding was remanded to the Examiner for consideration of claims now considered improper. *See* November 2015 Order 5 (remanding to consider claims 39–44 and 46–51); *see also* Ex. Deter. 6 (noting "only claims 39–44 and 46–51 are being considered here."). Under 37 C.F.R. § 41.77(f), we maintained our decision to reject claims 2, 3, 8, 12–18, 21–26, 29, and 32–37. Sept. 2016 Opinion 26 (vacated).

Our decisions were vacated. *Vederi*, 813 F. App'x at 501. Here, we reevaluate claims 2, 3, 8, 12–18, 21–26, 29, and 32–37 and the non-adoption of the proposed rejections of these claims based on the claim construction discussed in *Vederi*. Appeal Br. 7–34. In reaching our decision, we consider the record as a whole.

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[6] The panel consisted of Administrative Patent Judges Pothier, Dillon, and Branch.

Claimed Subject Matter

Canceled claim 1 and claim 8 are relevant to this appeal and are reproduced below:

> 1. (Canceled) In a system including an image source and a user terminal having a screen and an input device, a method for enabling visual navigation of a geographic area from the user terminal, the method comprising:
>
> receiving a first user input specifying a first location in the geographic area;
>
> retrieving from the image source a first image associated with the first location, the image source providing a plurality of images depicting views of objects in the geographic area, the views being substantially elevations of the objects in the geographic area, *wherein the images are associated with image frames acquired by an image recording device moving along a trajectory*;
>
> receiving a second user input specifying a navigation direction relative to the first location in the geographic area;
>
> determining a second location based on the user specified navigation direction; and
>
> retrieving from the image source a second image associated with the second location.
>
> 8. The method of claim 1, wherein the retrieving of the image corresponding to the first or second location comprises:
>
> identifying a street segment including the first or second location;
>
> identifying a position on the street segment corresponding to the first or second location; and
>
> identifying an image associated with said position.

The ’760 patent, 15:57–16:9, 16:38–45 (emphasis added).

Prior Art Relied Upon

Prior to withdrawing the rejections, the Examiner relied on the following as evidence of unpatentability:

Name	Reference	Date
Lachinski[7]	US 5,633,946	May 27, 1997

Michael J. Shiffer, *Augmenting Geographic Information with Collaborative Multimedia Technologies*, 11 Proc. Auto Carto. 367–376 (1993) ("Shiffer").

Frank Yee, *GPS & Video Data Collection in Los Angeles County: A Status Report, Position Location and Navigation Symposium*, Proc. IEEE Position Location and Navigation 388–393 (1994) ("Yee").

Kheir Al-Kodmany, *Using Web Based Technologies and Geographic Information Systems in Community Planning*, 7 J. Urb. Tech. 1–30 (2000) ("Al-Kodmany").

Withdrawn Rejections

The Examiner withdrew the following proposed rejections, for which Requester appeals:

Reference(s)	Basis	Claim(s)	
Al-Kodmany	§ 102(a)[8]	8	RAN 11–12 (referring to

[7] Requester indicates that Lachinski was cited in its February 6, 2013 Comments to explain how Yee's four-view images are created and is proper under 37 C.F.R. § 1.948(a)(2). Appeal Br. 34.
[8] The Leahy-Smith America Invents Act, Pub. L. No. 112-29, 125 Stat. 284 (2011) ("AIA"), amended 35 U.S.C. §§ 112, 102, 103, and 305. Changes to §§ 102 and 103 apply to applications filed on or after March 16, 2013.

			ACP 10–11); Appeal Br. 7–9
Shiffer, Yee	§ 103(a)	2, 3, 8, 12–18, 21–26, 29, 32–37	RAN 13–15 (referring to ACP 12–14); Appeal Br. 9–34

Appeal Br. 2–3.

II. MAIN ISSUES ON APPEAL

We review the appealed rejections for error based upon the issues identified by Patent Owner, and in light of the arguments and evidence produced thereon. *Cf. Ex parte Frye*, 94 USPQ2d 1072, 1075 (BPAI 2010) (precedential) (citing *In re Oetiker*, 977 F.2d 1443, 1445 (Fed. Cir. 1992)). "Any arguments or authorities not included in the brief permitted under this section or [37 C.F.R.] §§ 41.68 and 41.71 will be refused consideration by the Board, unless good cause is shown." 37 C.F.R. § 41.67(c)(1)(vii).

Based on the record, the main issues on appeal are:

(A) Did the Examiner err by failing to construe properly the recitation, "wherein the images are associated with image frames acquired by an image recording device moving along a trajectory" found in all the claims on appeal; and

(B) Did the Examiner err in withdrawing the rejection of patent claim 8 based on Shiffer and Yee?

Because the '760 patent has an effective filing date before March 16, 2013, we refer to the pre-AIA versions of §§ 102 and 103.

III. ANALYSIS

A. Claim Construction

As noted above, the ’760 patent has expired. We generally give claims’ recitations in expired patents their ordinary and customary meaning as would have been understood by “a person of ordinary skill in the art in question at the time of the invention.” *See Phillips v. AWH, Corp.*, 415 F.3d 1303, 1312–13 (Fed. Cir. 2005); *see also* MPEP § 2258(I)(G) (citing *Phillips*, 415 F.3d at 1316; *Ex parte Papst-Motoren*, 1 USPQ2d 1655 (BPAI Dec. 23, 1986)). Additionally, “[c]laims ‘must be read in view of the specification, of which they are a part’” (*Phillips*, 415 F.3d at 1315 (quoting *Markman v. Westview Instruments, Inc.*, 52 F.3d 967, 979 (Fed. Cir. 1995) (en banc))), and “the specification ‘is always highly relevant to the claim construction analysis’” (*id.* (quoting *Vitronics Corp. v. Conceptronic, Inc.*, 90 F.3d 1576, 1582 (Fed. Cir. 1996))).

Requester discusses the limitation of canceled claims 1 and 20 of the ’760 patent in its appeal brief. Although these claims are canceled (*see* the Jan. 2013 Amendment), claims 2, 3, 8, and 12–18 of the ’760 patent ultimately depends from canceled claim 1, and claims 21–26, 29, and 32–37 of the ’760 patent ultimately depend from canceled claim 20. Thus, each appealed claim includes either canceled claim 1’s or canceled claim 20’s recitations.

The Image Frames Limitation of canceled claims 1 and 20

All the claims on appeal ultimately depend from one of canceled claims 1 and 20 as noted above, and recite “wherein the images are

associated with image frames acquired by an image recording device moving along a trajectory" (the Image Frames Limitation[9]).

Although noting the phrase, "'moving along a trajectory' does not obviate the overall requirement that the image acquisition device travel[s] along the claimed trajectory" (RAN 7), the Examiner states that one skilled in the art would have understood the image recording device will stop, such as lights or stop signs, during its movement along a trajectory and that images can be acquired while the device is not in motion. *See id.* (citing the '760 patent 5:55–6:27); *see id.* at 7–8. We do not disagree with the Examiner, for the Federal Circuit's construction of the phrase "image frames acquired by an image recording device moving along a trajectory in canceled claims 1 and 20 includes an image recording device that acquires images *both* while moving and *while stationary*. *See Vederi*, 813 F. App'x at 504. We disagree, however, to the extent the Examiner has determined (*see* RAN 6–8) that the Image Frames Limitation should be construed to include "image recording devices that acquire images only while stationary (although the image recording device moves along a trajectory at other times)." *Vederi*, 813 F. App'x at 504.

The court in *Vederi* construed the term "moving" within the phrase "image frames acquired by an image recording device moving along a trajectory" found in claim 21 of the '025 patent. *Vederi*, 813 F. App'x at 501, 503–504. The court found "the claims to cover (1) image recording devices that acquire images while moving; (2) image recording devices that

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[9] Requester refers to the quoted limitation as "the 'Image Frames Limitation.'" Appeal Br. 2.

acquire images both while moving and while stationary," but not "(3) image recording devices that acquire images only while stationary (although the image recording device moves along a trajectory at other times)." *Id.* at 504. Canceled claims 1 and 20 of the '760 patent include the same recitation as claim 21 of the '025 patent addressed by the court in *Vederi*. *Compare* the '025 patent 17:51–53, *with* the '760 patent, 15:67–16:2, 17:41–43. As explained below, we apply a similar claim construction for the Image Frames Limitation in canceled claims 1 and 20 of the '760 patent.

The *Vederi* court applied the "broadest reasonable interpretation" to the claims and not an ordinary and customary meaning as understood by an ordinarily skilled artisan as set forth in *Phillips*. *Vederi*, 813 F. App'x at 504 (stating "[t]he broadest reasonable interpretation requires that the claim construction be reasonable in light of the specification"). Even so, the court considered the disclosure of the '025 patent in arriving at its construction. *Id.* (citing the '025 patent 2:27–29, 3:47–49, 3:54–57, 4:50–53, 4:55–58, 5:18–19, 5:52–54, 6:58–61, Fig. 9). Similar discussions to those cited by the court in the '025 patent are found in the Specification of the '760 patent.

In particular, the Specification states "an image recording device moves along a path recording images of objects along the path" (the '760 patent 2:26–28), "[m]ovement to the camera 10 is provided by a base, platform, or motor vehicle moving at an average speed of preferably about 20 miles/hour" (*id.* at 4:58–60), and "the camera 10 moves along the path" (*id.* at 5:20). *See also id.* at 4:54–55 (discussing a camera moving along a path); 5:56–57 (same), 6:66–7:2 (same). The *Vederi* court also states "the [S]pecification contemplates that some photos may be taken while the

vehicle is stopped, for example, at an intersection." *Vederi*, 813 F. App'x at 504 (citing the '025 patent, Fig. 9); *see also* the '760 patent, Fig. 9.

When read in view of the Specification of the '760 patent, we determine that the ordinary and customary meaning of "moving" within the phrase "the images are associated with image frames acquired by an image recording device moving along a trajectory" in canceled claims 1 and 20 as understood by an ordinarily skilled artisan includes an image recording device that acquires images associated with image frames (1) while moving and (2) both while moving and while stationary as long as some images are associated with image frames acquired while the image recording device is moving.

Additionally, although not addressed by the court in *Vederi*, the Examiner states one cited reference (e.g., Al-Kodmany) "does not describe any specific 'trajectory' along which these images are acquired." RAN 12. The Examiner further states "that pictures at locations are taken, with no description of the process or timing or path (trajectory) that the image acquiring device takes." *Id.* In other words, the Examiner concluded that the recited "trajectory" in the Image Frames Limitation of claim 1 requires the image recording device to move along a *specified* path or has a specific process or timing. *See id.* Requester disagrees (Appeal Br. 4–7), arguing that the Examiner erred in requiring that the recited trajectory be "a specified trajectory[.]" *Id.* at 4 (underlining omitted) (citing RAN 8); *see id.* at 6.

We agree with Requester that claims 1 and 20 do not recite moving along a specified trajectory. The '760 patent describes a trajectory to be synonymous with a path. The '760 patent 3:57 (describing cameras

"moving along a trajectory/path."). The '760 patent also provides an "illustration of a trajectory" in Figure 9 where a camera is moved along a path (e.g., 110 including streets or blocks) making turns at intersections and circling around streets. *Id.* at 3:14–15, 7:66–8:5, Fig. 9. Although this path of streets (e.g., 110) may have been determined prior to recording in this example, we note that, when driving down a street, there exist a level of unpredictability or randomness, such as lane shifting, which deviates from any purported, specified path. *See* Appeal Br. 6 (stating "[a] POSITA would understand that 'down a street' does not require a 'specified' trajectory or a 'description of the path,' as movement down a street frequently requires changes in route due to detours, accidents, heavy traffic, and other issues.") Furthermore, the Figure 9 example in the disclosure is described as "an illustration" of a trajectory, whereas the claim's scope is not limited to this illustration. *Compare* the '760 patent 15:67–16:2, *with id.* at 3:14–15 (stating "FIG. 9 is an illustration of a trajectory"); *see also id.* at 7:66–8:5 (describing Figure 9).

In summary, we find that the phrase "wherein the images are associated with image frames acquired by an image recording device moving along a trajectory" in canceled claims 1 and 20 requires that the image recording device moves along a path, course or route, but that the path need not be predetermined or specified, and that the image recording device acquires the "plurality of images" that "are associated with the image frames acquired by an image recording device" (1) while moving and (2) both while moving and while stationary as long as some image frames are acquired while the image recording device is moving.

B. Proposed Rejections

Requester appeals the Examiner's decision finding claims 2, 3, 8, 12–18, 21–26, 29, and 32–37 patentable or confirmed. Appeal Br. 1. Patent Owner did not submit a respondent brief. As explained below, we present a new ground of rejection for patent claims 2, 3, 8, 12–18, 21–26, 29, and 32–37 pursuant to 37 C.F.R. § 41.77(b).

1. Shiffer and Yee

a. All Claims

Claims 2, 3, 8, and 12–18 ultimately depend from canceled claim 1; claims 21–26, 29, and 32–37 ultimately depend from canceled claim 20. For each of claims 2, 3, 8, 12–18, 21–26, 29, and 32–37, we adopt the following Requester's and Examiner's findings and conclusions related to canceled claims 1 and 20 as our own. *See* Appeal Br. 9–14 (addressing the Navigation Direction Limitation[10] found in canceled claims 1 and 20) (citing Request 123–134); *see also* Request for *Inter Partes* Reexamination 121–134 (addressing canceled claim 1) (citing Shiffer 369–73, Fig. 3; Yee 389–90; Ex. CC-F; OTH-B 104:16–20, 121:1–3; OTH-D 17:7–9); Ex. CC-F 1–10 (citing Shiffer 369–73, Fig. 3; Yee 389–90; OTH-B 104:16–20; OTH-D 17:7–9); Nov. 2012 Non-Final Act. 9–11 (addressing canceled claim 1) (citing Shiffer 369–73, Fig. 3; Yee 389–90, Fig. 1; Request 121–23); Aug. 2015 3PR Comments 9–13 (addressing Shiffer, Yee, and the Navigational

[10] Requester refers to the recitation "receiving a second user input specifying a navigation direction relative to the first location in the geographic area" found in canceled claim 1 and 20 (the '760 patent 16:3–5, 17:48–50) as the "Navigation Direction Limitation." Appeal Br. 2.

Direction Limitation found in canceled claims 1 and 20) (citing Shiffer 372–73, Figs. 2–3).

In withdrawing the rejection of amended claim 8[11] (now improper), which depended from canceled claim 1, based on Shiffer and Yee, the Examiner states:

> Clicking on one arrow [in Figure 3 of Shiffer] may provide a pannable rendering (which is not an image obtained by a recording device in motion but appears to be computer-generated) or a video obtained at a specific location (again, not obtained by a recording device in motion, Shiffer at 371 noting "fixed-position shots"), but in either case selecting another arrow for a second video or rendering is not read as a step of providing input of a direction relative to the first, rather it is merely clicking locations on map, only wherein the locations are shown as arrows that show the camera angle of a new image do not specify a navigation direction relative to the first. Yee fails to disclose the second selection as noted above; rather Yee discloses selecting various locations on a map, without providing a navigation direction relative to a first.
>
> Thus Shiffer in view of Yee fails to disclose receiving a second user input specifying a navigation direction relative to the first location in the geographic area and the rejection was withdrawn.

RAN 15 (reproducing Shiffer, Fig. 3) (emphasis omitted).

The Examiner thus stated two reasons for withdrawing the rejection based on Shiffer and Yee. First, the Examiner found that Shiffer does not teach obtaining images by a recording device in motion. *Id.* Second, the Examiner determined that neither Shiffer nor Yee teaches the step of "receiving a second user input specifying a navigation direction relative to

[11] At the time of withdrawal, claim 8 depended from claim 1, and claims 2, 3, and 12–18 ultimately depended from claim 8.

the first location in the geographic area" as recited in canceled claims 1 and 20 (the Navigation Direction Limitation). RAN 15.

We address the Navigational Direction Limitation first. In disputing the Examiner's conclusion, Requester argues that "[t]he Examiner is incorrect because Shiffer teaches receiving successive user selection of locations on a map to display images of the those [sic] locations. A POSITA[12] would understand that Shiffer teaches the Navigation Direction Limitation." Appeal Br. 11. More specifically, Requester focuses on the discussion in Shiffer of "providing navigation images." *Id.* (citing Shiffer 371–72). Shiffer discusses "three main shot types," including "fixed position," "360 degree axial view," and "navigation." Shiffer 371.

Fixed shots are described as allowing a user to view a video clip "from a fixed camera angle. They are symbolized on the visual quality map as arrows that match the direction of the camera angle." Shiffer 371–72, *cited in* Appeal Br. 11. In contrast and separate from the fixed position and 360 degree axial view shots in Shiffer, navigation shots or images are disclosed as:

> [A]llow[ing] users to drive or fly through the study area. They are designed to aid visual navigation by enabling the user to view a geographic area from a moving perspective such as that experienced when traveling through a region. Navigation images are represented on the map as linear symbols that represent the routes available to the user. They are illustrated as large arrows in the lower right window of Figure 2.

Id. at 372.

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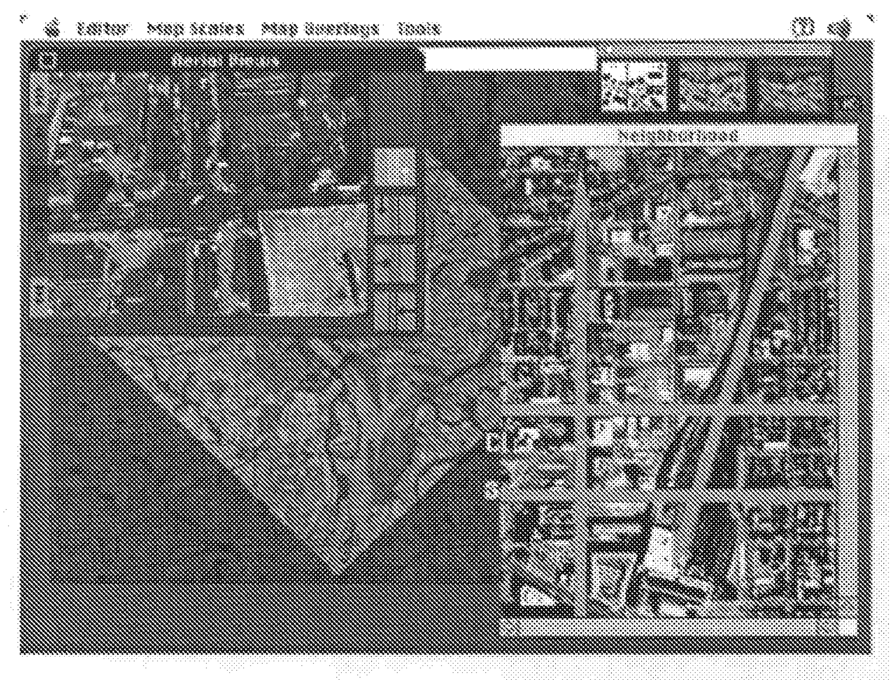
[12] Person of Ordinary Skill In The Art.

Shiffer further states:

> The controller at the left edge of the "Aerial Views" window, (the upper left window), allows the user to control the direction of flight (forward or reverse), as well as the speed of flight, by sliding the pointer towards either end of the controller. The user can determine the camera angle by selecting one of the iconic buttons at the right side of the "Aerial Views" window. The arrows on the icons represent the direction the camera was pointing with respect to the subject (in this case, the subject is the street). The user can determine the camera angle by selecting one of the iconic buttons at the right side of the "Aerial Views" window. The arrows on the icons represent the direction the camera was pointing with respect to the subject (in this case, the subject is the street).

Id. at 372–73.

To illustrate visually, Figure 2 is reproduced below:



Above, Figure 2 of Shiffer discloses a "Visual Analysis using Aerial Images" that contains an "Aerial Views" window (upper left) and a "Neighborhood" window (lower right). *Id.* at 372, Fig. 2. The "Neighborhood" window has a map of a geographic area containing linear symbols shown as large arrows representing the routes available to the user. The "Aerial Views" window also has a map of a geographic area, but this window contains (1) a controller bar (left edge) with up and down arrows used to control the forward/reverse directions within the area by sliding the pointer toward either end of the controller and (2) iconic buttons (right edge) used to select a camera angle within the area. *Id.* at 372–73.

Additionally, when addressing Figure 3, Shiffer teaches "users [can] inspect the proposed site," including "by selecting appropriate arrows linked to the map." *Id.* at 373, Fig. 3. Thus, similar to Figure 3, the above discussions in Shiffer related to Figure 2 teach or suggest that a user can first select a particular linear symbol (shown as a long arrow) found in Figure 2's "Neighborhood" window, which are placed at various locations within the window's map (*see id.* at 372–33) (e.g., "receiving a first user input specifying a first location in the geographic area" as recited in canceled claims 1 and 20), and then sliding the pointer towards a controller's end found in "Aerial Views" window in Figure 2 to either forward or reverse direction (e.g., a navigation direction) from the originally selected location (e.g., the first location) (e.g., "receiving a second user input specifying a

navigation direction relative to the first location in the geographic area”).

Shiffer further teaches by sliding the controller’s pointer (shown in Figure 2 above) in a forward or reverse direction, a user can “drive or fly through the study area.” *Id.* at 372–73. Shiffer thus further teaches or suggests controlling the direction of movement or flight through a geographic area (e.g., the geographic area identified by the large arrows in the “Neighborhood” window in Figure 2) from one location (e.g., the originally selected location) to another location by sliding the controller’s pointer in a forward or reverse direction (e.g., a location forward or reverse from the original spot using controller’s sliding function shown in Figure 2’s “Aerial Views” window (left)). *See id.*; *see also* Aug. 2015 3PR Comments 9–10 (quoting Shiffer 372–73); Feb. 2016 3PR Comments 3–4 (citing Ex. Deter. 12–13; Shiffer 372–373); 3PR Reply 5 (citing Shiffer 372–73). As such, Shiffer teaches or suggests “determining a second location based on the user specified navigation direction,” which is “relative to the first location in the geographic area” as canceled claims 1 and 20 recite.

As another example, a user can select a first location by sliding the controller’s pointer in forward direction in Shiffer’s Figure 2 (e.g., “receiving a first user input specifying a first location in the geographic area”) and then, the user can specify a navigation direction (e.g., forward) relative to this first location by further sliding the controller’s pointer in the forward direction in Shiffer’s Figure 2 to control the flight direction through a region. *See* Shiffer 372–73, Fig. 2; *see also* Ex. Deter. 11–12 (quoting from vacating decision that discusses Shiffer 372–73 and sliding the pointer

in Figure 3). These above teachings in Shiffer suggest to one skilled in the art that a user can specify a navigation direction relative to a location and suggest the Navigational Direction Limitation found in canceled claims 1 and 20.

We thus, disagree with the Examiner that Shiffer teaches merely selecting locations on a map that have "arrows that show the camera angle of a new image." RAN 15. Additionally, as explained above, we disagree with Patent Owner that sliding the controller forward or reverse "merely controls the playback of a video" (PO Comments 7; PO Reply 5) and does not involve receiving a second user input specifying a navigation direction relative to a first location in a geographic area as argued (*see* PO Comment 4, 6–7). In fact, Patent Owner states that the pointer movement is "constrained by the currently selected route" (PO Comments 7), which implies that sliding the controller forward or reverse would limit the selected locations along the controller ends to those that are relative to each other and based on each other (e.g., based on the selected route). Because Shiffer teaches or suggests the Navigation Direction Limitation and the recited "determining a second location based on the user specified navigation direction" in canceled claims 1 and 20 for previously explained reasons, any arguments related to this claimed feature and that one skilled in the art "would not have combined the teachings of Shiffer and Yee to arrive at claim" 1 and 20 are unavailing. PO Comments 5 (bolding and underlining omitted); *see also* at 5–7; PO Reopen Request 22–23.

As for Shiffer's "navigation shots," Patent Owner contends its "iconic button" determines a camera angle from the same location and thus does not

disclose the Navigation Direction Limitation. *See* PO Reopen Request 24 (citing Shiffer 371–73; June 2015 Op. 12–13). But, as discussed above, this argument is unavailing because the rejection relies on Shiffer's controller and its sliding function, not the "iconic buttons," found in Figure 2 to teach and suggest the Navigation Direction Limitation. *See* Aug. 2015 3PR Comments 10 (noting "the 'iconic buttons' are an extra feature in Shiffer, separate and apart from the navigation images"); *see also id.* at 10–11.

Regarding Shiffer's Figure 3, Patent Owner argues selecting arrows on its map access images associated with arrows and are unaffected by or without consideration of a previous selected location and thus do not disclose the Navigation Direction Limitation in canceled claim 1. PO Reopen Request 25–26 (citing Shiffer 371–73, Fig. 3; June 2015 Op. 13 (vacated)); *see also* PO Comments 4 (arguing Shiffer teaches arrows at different locations on a map in Figure 3 point in the direction of viewing "without regard to the previously selected 'first location'" and "the new selection [in Shiffer] is not selected 'based on the user specified navigation direction'"); PO Reply 4. We are not persuaded.

As discussed above, the rejection mainly relies on Shiffer's Figure 2, not Figure 3 and its arrows, to teach and suggest the Navigation Direction Limitation disputed by Patent Owner. Thus, some of Patent Owner's arguments addressing Figure 3's features do not consider fully the scenarios discussed and explained above in more detail. Also, concerning Shiffer's Figure 3, we do not agree entirely with Requester that one skilled in the art would have understood that selecting various arrows on the map this figure, which indicate the camera angle direction, would necessarily "specif[y] a

navigation direction relative to the first location in the geographic area" as recited. Appeal Br. 13. For example, a first camera angle directional arrow for a first location received by a first user input may point easterly (e.g., one of the left arrows in zoomed-in box of the "Neighborhood" window in Figure 3), and a second camera angle directional arrow for a second location received by a second user input may point north westerly (e.g., one of the right arrows in the zoomed-in box of the "Neighborhood" window in Figure 3). Shiffer 373, Fig. 3. In this scenario, one having ordinary skill in the art would have understood that the second user input (e.g., selecting the north westerly arrow after selecting the easterly arrow) does not necessarily specify a navigation direction relative the first location as recited.

On the hand, Shiffer describes various options in Figure 3 to inspect a site, including: (1) the user 'can view the proposal from various perspectives around the site by selecting appropriate arrows linked to the map" (*id.*) and (2) the user "can navigate around a specific rendering by zooming and panning with on-screen controls" (*id.*). The former option teaches or suggests "receiving a first user input specifying a first location in the geographic area" as recited in canceled claims 1 and 20, such as by selecting an arrow in Shiffer's Figure 3 in its "Neighborhood" window. The latter option suggests that "a second user input" can "specif[y] a navigation direction relative to the first location" by navigating around an image using "on-screen controls" to zoom or pan the image. *See id.*; *see also* Aug. 2015 3PR Comments 13 (quoting Shiffer 373) (noting these options). Thus, Shiffer's Figure 3 teaches and suggests yet another example of the Navigation Direction Limitation, recited in canceled claims 1 and 20.

Patent Owner contends one skilled in the art would not "equate" Shiffer's zooming and panning feature to "specifying a navigation direction" because the zooming feature "merely magnifies that portion of the image without changing locations" and "does not move the viewer any closer to the landmark." PO Reopen Request 27 (citing June 2015 Op. 14 (vacated)). We are not persuaded. Notably, canceled claims 1 and 20 recite "determining a second location," not changing or moving locations. In any event, Patent Owner provides no evidence that zooming magnifies an image without changing its location. *See id.* An ordinary understanding of zooming, as Shiffer teaches, includes simulating movement away from or towards a location[13] and thus, an artisan of ordinary skill would have understood Shiffer's zooming feature would specify a "navigation direction" relative to the original location (e.g., moves towards another location within the area as well as away from the original location).

Additionally, Patent Owner disputes Shiffer's zooming feature but does not dispute its panning feature fails to specify "a navigation direction" as recited. *See id.*; *see also* Aug. 2015 3PR Comments 12 (noting Patent Owner's argument "ignores the 'panning' feature of Shiffer, as shown in Figure 3 and described on page 373"). Furthermore, claim 15, which ultimately depends from claim 1, additionally recites that "a navigation button" (claims 12 and 14) "upon actuation" "retriev[es] the image associated with the second location" (claim 12) and "indicates direction of

[13] *Zoom*, The American Heritage Dictionary, *available at* https://www.ahdictionary.com/word/search.html?q=zoom (def. 5) ("To simulate movement rapidly away from or toward a subject using a zoom lens or other optical device") (last visited April 16, 2021).

motion" (claim 14), "includ[ing] . . . panning left or right" (claim 15). As such, consistent with the Specification of the '760 patent, Shiffer's panning feature suggests a navigation and moving direction or can "specify[] a navigation direction" as recited.

In the event that selecting to zoom or pan an image as taught by Shiffer is not considered "receiving second user input specifying a navigation direction relative to the first location" as canceled claims 1 and 20 recite (for which we disagree), Shiffer's Figure 2 and its discussed features as previously explained teach and suggest the Navigation Direction Limitation.

Regarding the Examiner's second reason for withdrawing the rejection based on Shiffer and Yee, Requester argues that Shiffer's images are obtained by a recording device and are not computer generated. Appeal Br. 14 (citing Shiffer 373). The Examiner states that Shiffer's images "appear[] to be computer-generated" and additionally, that Shiffer does not teach obtaining images by recording device in motion. RAN 15. We agree with Requester that Shiffer teaches and suggests to one skilled in the art that the images are acquired by image recording device. For example, Shiffer teaches "the direction of the camera's angle" (Shiffer 372) and "the direction of the camera was pointing with respect to the subject (in this case, the subject is the street)" (*id.* at 373). One skilled in the art would have recognized that Shiffer's teaching of the direction the camera was pointing teaches that a camera (e.g., an image recording device) was used to acquire images. *See id.*

On the other hand, we agree with the Examiner that Shiffer does not disclose explicitly obtaining images by an image recording device in motion. RAN 15. Shiffer discusses shot types in the context of how the user is to view images (Shiffer 371–72) but is silent about whether these shots were acquired while in motion. *See generally* Shiffer. But, the prior art references must be considered in combination and in their entirety. *See W.L. Gore & Associates, Inc. v. Garlock, Inc.*, 721 F.2d 1540, 1552 (1983), *cited in* Appeal Br. 13. Yee, which is part of the rejection, teaches a technique of acquiring images frames using an image recording device moving along a path. Yee 389 (stating "[t]he function of the van is to dynamically collect the *real* locations of streets and objects as *it travels*.") (second emphasis added), 390 (stating "the GeoVan, meeting the above conditions, can gather all that data in one drive over the project area. Globally, the ten cameras see everything . . . while moving down the road"), 392 (discussing "the Geo Van on the road" and "this 'driving the road'' technique of data collection"); *see also* Appeal Br. 29 (quoting from Yee 389, 391). When combining Yee's image acquisition technique with Shiffer (*see* Request 122–23 (addressing reasons to combine, including that Yee "facilitates collecting images of a large geographic area in an efficient manner")), we determine that the Shiffer/Yee system teaches and suggests "the images are associated with image frames acquired by an image recording device moving along a trajectory" as canceled claims 1 and 20 recite and as this recitation (the Image Frames Limitation) is construed in Section (III)(A).

For the above reasons, we determine that Shiffer and Yee teach or suggest canceled claim 1, for which each of claims 2, 3, 8, and 12–18

depends, and canceled claim 20, for which each of claims 21–26, 29, and 32–37 depends.

b. Claims 2, 3, 12–18, 21–26, 29, and 32–37

Along with the above discussion adopting the noted findings and conclusions related canceled claims 1 and 20 (*see, e.g.*, Appeal Br. 9–14), we further adopt Requester's additional findings and conclusions for claims 2, 3, 12–18, 21–26, 29, and 32–37. *See id.* at 14–34 (citing Request 123–134; Shiffer 369–73, Fig. 3; Yee 389, 391–92). As previously stated, Patent Owner did not submit a respondent brief and thus did not respond to the findings and conclusions of these claims presented by Requester. Other than its continual disagreement with the claim construction of canceled claims 1 and 20 and the above-addressed arguments, Requester presents no specific arguments for these claims. *See* PO Reopen Request 22–27; *see also* PO Comments 3–7; PO Reply 3–5.

In summary, claims 2, 3, 12–18, 21–26, 29, and 32–37 are newly rejected under 35 U.S.C. § 103(a) based on Shiffer and Yee pursuant to 37 C.F.R. § 41.77(b).

c. Claim 8 – Additional Findings and Conclusions

Claim 8 depends from claim 1 and adds "wherein the retrieving of the image corresponding to the first or second location comprises: identifying a street segment including the first or second location; identifying a position on the street segment corresponding to the first or second location; and identifying an image associated with said position." The '760 patent 16:38–45. We further adopt Requester's findings and conclusions related to claim 8 as our own. *See* Appeal Br. 10–14 (citing Request 123–134, 141–144;

Shiffer 371–73, Fig. 3); *see also* Request for *Inter Partes* Reexamination 141–144 (citing Shiffer 371, 373; Ex. CC-F); Ex. CC-F 16–18 (addressing claim 8) (citing Shiffer 371, 373); *see also* February 2013 3PR Comments 18–22 (citing Shiffer 369–71, 373; Yee 391–92, Abstract; Lachinski 3:32–37, 5:25–31, 9:42–46, 12:52–13:2, 13:40–46, 13:56–63, 14:41–53 (explaining Yee/GEOSPAN's mobile mapping system)).

Additionally, when discussing an "Automobile Traffic Analysis" shown in Figure 1, Shiffer teaches accessing data "by pointing to an associated street link on the interactive map." Shiffer 371. This at least suggests Shiffer accesses data related to a location involves "identifying a street segment including the first or second location" (e.g., a particular street on a map) and "identifying a position on [a] street segment corresponding to the first or second location" (e.g., the associated street link associated with the particular street) as claim 8 recites. Shiffer teaches, when addressing Figure 3, that "users can sequentially move through a series of site images while an associated arrow highlights on the map as each image is displayed" (*id.* at 373), also suggesting that this moving technique involves identifying street segments and positions related to a location and identifying an image associated with the position when retrieving an image corresponding to a location as the user moves through the images. *See id.* By applying these teachings to Shiffer's Figure 2's map and navigation images that allow a user to drive or fly through a study area (*id.* at 372, Fig. 2), an ordinary skilled artisan would have recognized that Shiffer suggests further "identifying an image associated with said position [on a street segment including a first or second location]" as claim 8 recites.

Additionally, Yee discloses GeoSpan has developed a mobile mapping system, entitled GeoVan, that processes data for integration into a Geographic Information System (GIS). Yee 388. More specifically, Yee teaches data gathered by the GeoVan (e.g., images, locations, and selected information items) are processed by GeoVan software and loaded into GIS systems. *Id.* at 389, 391. Yee further teaches a Visual Interface System that stores, locates, and retrieves video images. *Id.* at 391. In particular, Yee discloses a user can point at a road segment or specific location on a map and then display an image for that segment. *Id.* at 391–92. Yee also teaches using a GPS receiver with the GeoVan "for image reference location." *Id.* at 390.

Thus, to the extent that Shiffer does not teach claim 8's limitations, Yee's teachings, when combined with Shiffer, further suggest a known process of "retrieving from an image source" (e.g., GeoVan's mobile mapping system and GIS systems) an "image associated with [a] first" or "second location" (e.g., images related to a road segment or specific location) involving claim 8's steps. *See id.* at 389, 391–92. Yee suggests its technique, when combined with Shiffer, such as its Figure 2 "Visual Analysis," includes "identifying a street segment" (e.g., identifying a road segment) associated with a location (e.g., a specific location associated with a road segment), "identifying a position on the street segment" (e.g., using a GPS receiver's stored data) related to a location, and "identifying an image associated with said position" (e.g., displaying an image for a road segment involves identifying the image associated with the relevant street segment's position). *See id.* at 390–92.

This resulting Shiffer/Yee system is a combination of familiar elements according to methods known to an ordinarily skilled artisan of "retrieving of the image" from an image source that include the steps recited in claim 8 and yields no more than the predictable result of obtaining a location's image by identifying its street segment, a position on the segment, and the image associated with the segment's location to permit a user to drive or fly through a study area as Shiffer provides. *See KSR Int'l Co. v. Teleflex Inc.*, 550 U.S. 398, 416 (2007). Also, to the extent Shiffer and Yee's image retrieving techniques differ, the proposed combination is also merely a substitution of one known element (e.g., Yee's image retrieving technique) for another known in the field (e.g., Shiffer's technique) and yields no more than predictable result of obtaining an image associated with an location specified by the user. *See id.*

Yee further teaches GeoSpan uses TIGER (Topological Integrated Geographic and Referencing) file format to record its data (e.g., images) that are loaded into the GIS systems. *Id.* at 391. Lachinski explains the TIGER file format improves the accuracy of coordinates (e.g., identify position data) within the files and adds information (e.g., missing street and address information), which can assist in (1) identifying street segments related to a location and position and (2) creating relationships between the segments and images for a variety of GIS applications. Lachinski 1:15–23, 2:16–20, 3:32–37, 9:36–45,11:55–12:62, 13:56–63, 14:41–58, 16:33–17:38, Figs. 9–10. Lachinski also discusses its street segment database can store large amounts of image sets that can be manipulated and managed using an indexing method. *Id.* at 13:51–55. Thus, as further evidenced by Lachinski,

Yee's TIGER file format includes a process of retrieving images corresponding a location by "identifying a street segment including the . . . location" (e.g., disclosed street segment related to a location), "identifying a position on the street segment" corresponding to a location (e.g., the identified position data), and "identifying an image associated with said position" (e.g., the disclosed relationship between the street segments and images) as claim 8 recites. One skilled in the art would have recognized that including Lachinski's process in the Shiffer/Yee system would have improved coordinate accuracy with its system, and would have permitted a large amount of images to be stored and managed.

As previously stated, Patent Owner did not submit a respondent brief and thus did not respond to the findings and conclusions of these claims presented by Requester related to claim 8. Other than its continual disagreement with the claim construction of canceled claims 1 and 20 and the above-addressed arguments, Requester presents no specific arguments for this claim.

Given the above discussion, we newly reject claim 8 under 35 U.S.C. § 103(a) based on Shiffer, Yee, and Lachinski pursuant to 37 C.F.R. § 41.77(b).

2. Other Proposed Ground for Claim 8

Requester further argues claim 8 should be rejected under 35 U.S.C. § 102(a) based on Al-Kodmany. Appeal Br. 7–9 (citing Request 76–85, 91, and 92). Requester argues that Al-Kodmany discloses the Image Frames Limitation found in canceled claims 1 and 20. *Id.* at 8–9. Requester further contends that even applying the Examiner's improper narrow construction,

Al-Kodmany discloses that images are acquired by identifying street locations and then traveling along the street to the identified locations. *Id.* at 8 (citing Al-Kodmany 16).

The Examiner initially adopted the proposed rejection of Al-Kodmany (November 7, 2012 Non-Final Act. 7–8 (citing Al-Kodmany 10, 16, 21, Figs. 5, 13) (referring to Exhibit CC-C)), but later withdrew the rejection (ACP 10–11). *See also* RAN 11–12.

Al-Kodmany discusses how to create 360-degree panoramic movies. Specifically, Al-Kodmany states:

> For visualization of major nodes along 18th Street, we first identified points of interest such as major intersections, areas with a high level of activity, and significant architectural points. Then we took digital images of these nodes with a wide-angle lens and a tripod and created panoramic movies. The panoramic movie files were constructed with Apple's Quicktime VR Authoring Studio. A total of 12 images per node were taken with a difference of 30 degrees. To encompass the whole area (360 degrees), the images were imported into the computer, retouched with Adobe Photoshop, and sewn together with Quicktime. On the map, the user saw a red circle icon, which indicated that there was a movie of this location available for viewing.

Al-Kodmany 16. Al-Kodmany teaches identifying points of interest along a street (i.e., 18th Street) and, after identification, taking images at the nodes. *See id.* Al-Kodmany therefore discloses a trajectory or path formed by the points of interest (e.g., major nodes along 18th Street).

Although Al-Kodmany discusses "*visualization* of major nodes along 18th Street," this sentence in Al-Kodmany does not address movement of a camera along 18th Street. *Id.* (emphasis added). Al-Kodmany further states

"we took digital images of these nodes with a wide-angle lens and a tripod." *Id.* By stating a wide-angle lens and a tripod are used to take the images "of these nodes," this passage implies that the same lens and tripod (e.g., image recording device) was used to take the images at the different nodes (e.g., locations), and as such, discusses the camera moves from one node to another along 18th Street (e.g., a trajectory). *Id.* However, Al-Kodmany is silent regarding whether the camera acquires images *while* moving or *both while* moving and stationary as we construed the phrase "image frames acquired by an image recording device moving along a trajectory" found in canceled claim 1 and as discussed previously in Section (III)(A). In fact, Al-Kodmany discusses using a *tripod* to capture the images at the "nodes" (e.g., locations along 18th Street), which suggests to an ordinarily skilled artisan that the camera acquires images only while stationary rather than (1) while the camera (e.g., an image recording device) is moving or (2) both while the camera is moving and while stationary.

Because Al-Kodmany does not disclose an image recording device acquiring images while moving or both while moving and stationary, Al-Kodmany does not disclose the Image Frames Limitations under 35 U.S.C. § 102 as proposed. We thus agree with the Examiner's ultimate determination not to adopt the rejection of claim 8 under 35 U.S.C. § 102(a) based on Al-Kodmany.

IV. CONCLUSIONS

We have reviewed the entire record, including submissions by Patent Owner and Requester and the decision in *Vederi*. We conclude:

Claims Not Rejected	35 U.S.C. §	Reference(s)/Basis	Affirmed	Reversed	New Ground
8	102(a)	Al-Kodmany	8		
2, 3, 8, 12–18, 21–26, 29, 32–37	103(a)	Shiffer, Yee		2, 3, 8, 12–18, 21–26, 29, 32–37	2, 3, 12–18, 21–26, 29, 32–37
8	103(a)	Shiffer, Yee, Lachinski			8
Overall Outcome					2, 3, 8, 12–18, 21–26, 29, 32–37

V. TIME PERIOD FOR RESPONSE

This decision contains a new ground of rejection pursuant to 37 C.F.R. § 41.77(b). Section 41.77(b) provides "a new ground of rejection pursuant to this paragraph shall not be considered final for judicial review."

Section 41.77(b) also provides that Patent Owner, within one month form the date of the decision, must exercise one of the following two options with respect to the new grounds of rejection to avoid termination of the appeal proceeding as to the rejected claims:

> (1) *Reopen prosecution.* The owner may file a response requesting reopening of prosecution before the examiner. Such a response must be either an amendment of the claims so rejected or new evidence relating to the claims so rejected, or both.

> (2) *Request rehearing*. The owner may request that the proceeding be reheard under § 41.79 by the Board upon the same record. The request for rehearing must address any new ground of rejection and state with particularity the points believed to have been misapprehended or overlooked in entering the new ground of rejection and also state all other grounds upon which rehearing is sought.

In accordance with 37 C.F.R. § 41.79(a)(1), the "[p]arties to the appeal may file a request for rehearing of the decision within one month of the date of: . . . [t]he original decision of the Board under § 41.77(a)." A request for rehearing must be in compliance with 37 C.F.R. § 41.79(b). Comments in opposition to the request and additional requests for rehearing must be in accordance with 37 C.F.R. § 41.79(c)-(d), respectively. Under 37 C.F.R. § 41.79(e), the times for requesting rehearing under paragraph (a) of this section, for requesting further rehearing under paragraph (c) of this section, and for submitting comments under paragraph (b) of this section may not be extended.

An appeal to the United States Court of Appeals for the Federal Circuit under 35 U.S.C. §§ 141–144 and 315 and 37 C.F.R. § 1.983 for an *inter partes* reexamination proceeding "commenced" on or after November 2, 2002 may not be taken "until all parties' rights to request rehearing have been exhausted, at which time the decision of the Board is final and appealable by any party to the appeal to the Board." 37 C.F.R. § 41.81. *See also* MPEP § 2682.

No time period for taking any subsequent action in connection with this appeal may be extended under 37 C.F.R. § 1.136(a)(1)(iv).

Requests for extensions of time in this proceeding are governed by 37 C.F.R. §§ 1.956 and 41.79(e).

In the event neither party files a request for rehearing within the time provided in 37 C.F.R. § 41.79, and this decision becomes final and appealable under 37 C.F.R. § 41.81, a party seeking judicial review must timely serve notice on the Director of the United States Patent and Trademark Office. *See* 37 C.F.R. §§ 90.1 and 1.983.

REVERSED
37 C.F.R. § 41.77

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Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

PTOL-90A (Rev. 04/07)

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

GOOGLE INC.
Requester

v.

Patent of VEDERI, LLC.
Patent Owner

Appeal 2018-007271
Reexamination Control 95/000,683
Patent 7,577,316 B2
Technology Center 3900

Before DENISE M. POTHIER, ERIC B. CHEN, and IRVIN E. BRANCH, *Administrative Patent Judges*.

POTHIER, *Administrative Patent Judge*.

DECISION ON APPEAL

I. STATEMENT OF CASE

This proceeding returns to us on remand from the Federal Circuit, vacating our previous decisions for this proceeding mailed August 15, 2016 and September 28, 2018. *See Vederi, LLC v. Google LLC*, 813 F. App'x 499, 501, 505 (Fed. Cir. 2020).

As background, Requester requested an *inter partes* reexamination ("the Request") of U.S. Patent No. 7,577,316 B2 ("the '316 patent"). The '316 patent claims priority to U.S. Applications: (1) 11/130,004 (now U.S. Patent No. 7,239,760 B2), filed May 16, 2005, and (2) 09/758,717 (now U.S. Patent No. 6,895,126 B2), filed on January 11, 2001. The '316 patent, code (60). Pursuant to 35 U.S.C. § 154(a)(2), the term of the '316 patent ended twenty (20) years from the filing date (i.e., January 11, 2001) of the earliest application (i.e., U.S. Application No. 09/758,717) for which a benefit is claimed under 35 U.S.C. §§ 120 and 121. *See* 35 U.S.C. § 154(a)(2) (2013); *see also* the Manual of Patent Examining Procedure (MPEP) § 2701(I). Thus, the '316 patent expired on January 11, 2021.[1]

"No amendment may be proposed for entry in an expired patent." 37 C.F.R. § 1.530(j); *see also* 37 C.F.R. § 1.121(j) (referring to § 1.530). That is, "[a]lthough the Office actions will treat proposed amendments [during a reexamination proceeding] as though they have been entered, the proposed amendments will not be effective until the reexamination certificate is issued

[1] The MPEP states the Office should "refuse to express to any person any opinion as to . . . the expiration date of any patent, *except to the extent necessary to carry out*: . . . (C) a . . . *reexamination proceeding to reexamine the patent.*" MPEP § 1701 (9th ed. rev. 10.2019 June 2020) (emphases added).

and published." 37 C.F.R. § 1.530(k). Notably, "no amendment, other than the cancellation of claims, will be incorporated into the patent by a certificate issued after the expiration of the patent." 37 C.F.R. § 1.530(j).

Accordingly, the reexamination proceeding will now be based on the original patent claims of the '316 patent. Thus, Patent Owner proposed amendments (*see, e.g.*, the April 22, 2013 Amendment ("Apr. 2013 Amendment")) to the claims, including new claims 36–43 (Apr. 2013 Amendment 9–10), are improper at this time. *See* MPEP § 2666.01. On the other hand and even though the '316 patent has expired, Patent Owner's proposed claim amendments to cancel claim (i.e., claims 1, 6–10, 16, 17, 26, and 29 (*see* Apr. 2013 Amendment 4–8)) are permitted. *See* MPEP § 2666.01. Additionally, claims 2–5, 11, 12, 14, 15, 25, 27, 28, and 30–35 are not subject to reexamination. *See* RAN 1 (box 1b).[2] Based on the foregoing, the reexamination proceeding will be based on original patent claims 13 and 18–24.

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[2] Throughout this Opinion, we refer to: (1) the Action Closing Prosecution (ACP) mailed September 24, 2013, (2) the Right of Appeal Notice (RAN) mailed June 4, 2014, (3) Patent Owner's Appeal Brief (PO Appeal Br.) filed September 3, 2014, (4) Requester's Respondent Brief (3PR Resp. Br.) filed October 2, 2014, (5) Patent Owner's Rebuttal Brief (PO Reb. Br.) filed May 22, 2015, (6) Requester's Appeal Brief (3PR Appeal Br.) filed September 8, 2014, (7) Patent Owner's Respondent Brief (PO Resp. Br.) filed October 9, 2014, (8) Requester's Rebuttal Brief (3PR Reb. Br.) filed May 21, 2015, (9) the Examiner's Answer (Ans.) mailed April 21, 2015, (10) Patent Owner's Request to Reopen Prosecution Under 37 C.F.R. 41.77(b)(1) (PO Reopen Request) filed September 16, 2016, and (11) the Examiner's Determination (Ex. Deter.) mailed February 8, 2018.

Upon review, we REVERSE the rejections adopted by the Examiner but present a new ground of rejection for patent claims 13 and 18–24 pursuant to 37 C.F.R. § 41.77(b).

Related Matters

The parties indicate that the ’316 patent was the subject of the following litigation: *Vederi, LLC v. Google Inc.*, Case No. 2:10-CV-07747 (C.D. Cal.), *Vederi, LLC v. Google Inc.*, Case No. 13-1057 (Fed. Cir.), and *Vederi, LLC v. Google Inc.*, Case No. 13-1296 (Fed. Cir.).[3] PO Appeal Br. 2; 3PR Appeal Br. 1, 22 (Related Proceedings App.). Additionally, the parties indicate that this appeal may be related to: (1) U.S. Patent No. 7,805,025 B2 (“the ’025 patent”), which is the subject of *inter partes* reexamination assigned Control No. 95/000,681, (2) U.S. Patent No. 7,239,760 B2 (“the ’760 patent”), which is the subject of *inter partes* reexamination assigned Control No. 95/000,682, and (3) U.S. Patent No. 7,813,596 B2, which is the subject of *inter partes* reexamination assigned Control No. 95/000,684.[4] PO Appeal Br. 2; 3PR Resp. Br. 1. The opinions in these proceedings were similarly vacated. *Vederi*, 813 F. App’x 501.

[3] Cases Nos. 13-1057 and 13-1296 were decided on March 14, 2014, and concerned U.S. Patent Nos. 7,239,760, 7,577,316, 7,805,025, and 7,813,596. *Vederi, LLC v. Google Inc.*, 744 F.3d 1376 (Fed. Cir. 2014), *rh’g en banc* and *cert denied.* The Federal Circuit reversed the claim construction of the district court, vacated the judgement, and remanded for further proceedings. *See id.* at 1384; *see also* PO Appeal Br. 2. The disputed claim language addressed by the Federal Circuit differs from the instant appeal.

[4] The court also discussed the phrase “web page for the retail establishment” within the phrase “accessing a web page for the retail establishment; and invoking by the computer system a display of the web page on the display screen.” *Id.* at 504–505. This phrase is not found in the claims of the ’316 patent being reexamined in this proceeding.

Parties Appeals

Patent Owner appealed the decision in the RAN rejecting claims 13 and 18–24 of the ’316 patent. PO Appeal Br. 3. Requester responded, and Patent Owner rebutted. *See generally* 3PR Resp. Br.; PO Reb. Br.

Requester cross-appealed the decision in the RAN determining a now-improper claim (i.e., claim 42) of the ’316 patent is patentable. 3PR Appeal Br. 2. Patent Owner responded, and Requester rebutted. *See generally* PO Resp. Br.; 3PR Reb. Br.

The Examiner’s Answer incorporates the RAN by reference (Ans. 1), which rejected claims 13 and 18–24.

An oral hearing was conducted on April 27, 2016. The transcript of the oral hearing has been made of record.

After the August 2016 Decision, Patent Owner requested reopening prosecution. *See* PO Reopen Request 9. We granted this request and remanded to the Examiner for consideration of a now-improper claim. May 23, 2017 Order 3–4. The Examiner determined that the rejection of the now-improper claim was not overcome. Ex. Deter. 2. We subsequently rendered a second opinion on September 28, 2018.

The Federal Circuit vacated our decisions. *Vederi*, 813 F. App’x at 501. The court in *Vederi* construed two phrases found in the claims of the ’025 patent. *Vederi*, 813 F. App’x at 501–504. These disputed phrases are: (1) “composite image” and (2) “moving” within the phrase “image frames acquired by an image recording device moving along a trajectory.” Specifically, the court agreed with how the panel construed the phrase “composite image” (*Vederi*, 813 F. App’x at 503) but did not fully adopt

how the panel construed the phrase "moving" (*id.* at 503–504).[5]

Given the claim construction addressed in *Vederi*, we reevaluate the rejections of claims 13 and 18–24 of the '316 patent. In reaching our decision, we consider the record as a whole.

Claimed Subject Matter

Canceled claim 1 and dependent claim 13 are reproduced below:

1. (Canceled) In a system including an image source and a user terminal having a screen and an input device, a method for enabling visual navigation of a geographic area from the user terminal, the method comprising:
receiving a first user input specifying a first location in the geographic area;
retrieving from the image source a first image associated with the first location, the image source providing a plurality of images depicting views of objects in the geographic area, the views being substantially elevations of the objects in the geographic area, wherein *the images are associated with image frames acquired by an image recording device moving along a trajectory*;
displaying an icon associated with an object in the geographic area;
receiving a user selection of the icon; and
identifying a second location based on the user selection.

[5] The court also discussed the phrase "web page for the retail establishment" within the phrase "accessing a web page for the retail establishment; and invoking by the computer system a display of the web page on the display screen." *Id.* at 504–505. This phrase is not found in the claims of the '316 patent being reexamined in this proceeding.

13. The method of claim 1,
wherein the first image is *a composite image created by processing pixel data of a plurality of the image frames*.

The ’316 patent 15:41–57, 16:37–39 (emphases added).

Prior Art Relied Upon

The record relies on the following as evidence of unpatentability:

Name	Reference	Date
Lachinski[6]	US 5,633,946	May 27, 1997
Murphy	US 6,282,362 B1	Aug. 28, 2001

Michael J. Shiffer, *Augmenting Geographic Information with Collaborative Multimedia Technologies*, 11 Proc. Auto Carto. 367–376 (1993) (“Shiffer”).

Frank Yee, *GPS & Video Data Collection In Los Angeles County: A Status Report, Position Location And Navigation Symposium*, Proc. IEEE Position Location and Navigation 388–393 (1994) (“Yee”).

J. Dykes, *An Approach To Virtual Environments For Visualization Using Linked Geo-referenced Panoramic Imagery*, 24 Computers, Env’t & Urb. Sys. 127–152 (2000) (“Dykes”).

Kheir Al-Kodmany, *Using Web-Based Technologies and Geographic Information Systems in Community Planning*, 7 J. Urb. Tech. 1–31 (2000) (“Al-Kodmany”).

[6] Requester indicates that Lachinski was cited in its comments to rebut Patent Owner’s response and explain how Yee’s four-view images are created. 3PR Resp. Br. 21–22; May 22, 2013 3PR Comments 27–28. Although not relying on Lachinski in the rejection, the Examiner discusses Lachinski, indicating the reference was properly cited under 37 C.F.R. § 1.948(a)(2). *See* RAN 20.

Nada Bates-Brkljac & John Counsell, *Issues in Participative Use of an Historic City Millennial Web Site*, IEEE Proc. Int'l Conf. Info. Visualization 119–125 (2000) ("Bates").

Current Rejections

The Examiner maintained the following proposed rejection, for which Patent Owner appeals:

Reference(s)	Basis[7]	Claims	RAN
Dykes	§ 102(a)	13	6–8
Al-Kodmany	§ 102(a)	13	8–10
Bates	§ 102(a)	13	10–12
Yee, Dykes	§ 103(a)	13, 18–24	12–15
Murphy, Yee	§ 103(a)	13, 18[8]–24	16–17
Shiffer, Yee	§ 103(a)	13, 18–24	18–19

PO Appeal Br. 5.

II. MAIN ISSUE ON APPEAL

We review the appealed rejections for error based upon the issues identified by Patent Owner, and in light of the arguments and evidence

[7] The Leahy-Smith America Invents Act, Pub. L. No. 112-29, 125 Stat. 284 (2011) ("AIA"), amended 35 U.S.C. §§ 112, 102, 103, and 305. Changes to §§ 102 and 103 apply to applications filed on or after March 16, 2013. Because this application has an effective filing date before March 16, 2013, we refer to the pre-AIA versions of §§ 102 and 103.

[8] Both the Examiner and Patent Owner include claims 16 and 17 in this rejection as well as the rejection based on Shiffer and Yee. PO Appeal Br. 5; RAN 16, 18. Because claims 16 and 17 have been canceled, we presume these inclusions are typographical errors and render the errors harmless.

produced thereon. *Cf. Ex parte Frye*, 94 USPQ2d 1072, 1075 (BPAI 2010) (precedential) (citing *In re Oetiker*, 977 F.2d 1443, 1445 (Fed. Cir. 1992)). "Any arguments or authorities not included in the brief permitted under this section or [37 C.F.R.] §§ 41.68 and 41.71 will be refused consideration by the Board, unless good cause is shown." 37 C.F.R. § 41.67(c)(1)(vii).

Based on the disputed errors presented by the parties, the main issue on appeal is, as currently presented, did the Examiner err in rejecting patent claims 13 and 18–24?

III. ANALYSIS

A. Claim Construction

As noted above, the '316 patent has expired. Because the '316 patent has expired, we give its claims' recitations "their ordinary and customary meaning" as would have been understood by "a person of ordinary skill in the art in question at the time of the invention." *Phillips v. AWH Corp.*, 415 F.3d 1303, 1312–13 (Fed. Cir. 2005); *see also* MPEP § 2258(I)(G) (citing *Phillips*, 415 F.3d at 1316; *Ex parte Papst-Motoren*, 1 USPQ2d 1655 (BPAI Dec. 23, 1986)). Additionally, "[c]laims 'must be read in view of the specification, of which they are a part'" (*Phillips*, 415 F.3d at 1315 (quoting *Markman v. Westview Instruments, Inc.*, 52 F.3d 967, 979 (Fed. Cir. 1995) (en banc))), and "the specification 'is always highly relevant to the claim construction analysis'" (*id.* (quoting *Vitronics Corp. v. Conceptronic, Inc.*, 90 F.3d 1576, 1582 (Fed. Cir. 1996))).

The parties discuss limitations of canceled claim 1 and claims 13, 18, 20, and 23 of the '316 patent in their respective briefings. PO Appeal Br.

5–23; *see* 3PR Appeal Br. 18–20. Although claim 1 is canceled (*see* the Apr. 2013 Amendment 4), claims 13 and 18–24 of the '316 patent ultimately depend from canceled claim 1. Thus, each appealed claim includes canceled claim 1's recitations.

1. The Image Frames Limitation of Canceled Claim 1

All the claims on appeal ultimately depend from canceled claim 1 and recite "wherein the images are associated with image frames acquired by an image recording device moving along a trajectory" ("the Image Frames Limitation"[9]). The Examiner finds this phrase is not limited to the embodiment in the '316 patent and includes "a video recorder or still camera that records image frames." RAN 23; *see id.* at 22–27 (citing the '316 patent 3:58–60, 4:12–15, 5:9–12, 5:52–6:23, Figs. 2, 9). Requester agrees, contending that the Examiner correctly construed the Image Frames Limitation. 3PR Appeal Br. 18; *see also* 3PR Resp. Br. 3–7.

Patent Owner argues that the Examiner unreasonably construed the term "moving" within the Image Frames Limitation to mean "in motion or not in motion." PO Appeal Br. 7, 12–16 (citing RAN 23–24, 26, 28; the '316 patent 3:36–60, 5:55–46). Patent Owner contends the phrase "image frames are acquired by an image recording device moving along a trajectory" to mean "that the image frames are acquired by an image recording device that is in motion along the trajectory at the time of the acquisition." *Id.* at 9; *see id.* at 8–9 (citing Oxford Dictionaries; Webster's Third New International Dictionary (defining "moving"); Exs. A–B). Patent

[9] Requester refers to the quoted limitation as "the 'Image Frames Limitation.'" 3PR Appeal Br. 18.

Owner contends the Specification of the ’316 patent confirms its understanding. *Id.* at 9–12 (citing the ’316 patent 2:26–30, 3:46–57, 4:50–62, 5:18–22, 5:52–54, 6:56–62, 7:58–64, code (57)).

The court in *Vederi* construed the term “moving” within the phrase “image frames acquired by an image recording device moving along a trajectory” found in claim 21 of the ’025 patent. *Vederi*, 813 F. App’x at 501, 503–504. The court found “the claims to cover (1) image recording devices that acquire images while moving; (2) image recording devices that acquire images both while moving and while stationary,” but not “(3) image recording devices that acquire images only while stationary (although the image recording device moves along a trajectory at other times).” *Id.* at 504. Canceled claim 1 of the ’316 patent includes the same recitation as claim 21 of the ’025 patent addressed by the court in *Vederi*. *Compare* the ’025 patent 17:51–53, *with* the ’316 patent 15:51–53. As explained below, we apply a similar claim construction for the Image Frames Limitation in canceled claim 1 of the ’316 patent.

The *Vederi* court applied the “broadest reasonable interpretation” to the claims and not the ordinary and customary meaning as understood by an ordinarily skilled artisan as set forth in *Phillips*. *Vederi*, 813 F. App’x at 504 (stating “[t]he broadest reasonable interpretation requires that the claim construction be reasonable in light of the specification”). Even so, the court considered the disclosure of the ’025 patent in arriving at its construction. *Id.* (citing the ’025 patent 2:27–29, 3:47–49, 3:54–57, 4:50–53, 4:55–58, 5:18–19, 5:52–54, 6:58–61, Fig. 9). Similar passages to those cited by the court in the ’025 patent are found in the Specification of the ’316 patent.

In particular, the Specification states "an image recording device moves along a path recording images of objects along the path" (the '316 patent 2:26–28), "[m]ovement to the camera 10 is provided by a base, platform, or motor vehicle moving at an average speed of preferably about 20 miles/hour" (*id.* at 4:55–57), and "the camera 10 moves along the path" (*id.* at 5:18). *See also id.* at 4:51–53 (discussing a camera moving along a path); 5:53–54 (same), 6:59–61 (same). The *Vederi* court also states "the [S]pecification contemplates that some photos may be taken while the vehicle is stopped, for example, at an intersection." *Vederi*, 813 F. App'x at 504 (citing the '025 patent, Fig. 9); *see also* the '760 patent, Fig. 9.

When read in view of the Specification of the '316 patent, we determine that the ordinary and customary meaning of "moving" within the phrase "the images are associated with image frames acquired by an image recording device moving along a trajectory" in canceled claim 1, as understood by an ordinarily skilled artisan at the time of the invention, includes an image recording device that acquires images associated with image frames (1) while moving and (2) both while moving and while stationary as long as some images are associated with image frames acquired while the image recording device is moving.

Additionally, although not addressed by the court in *Vederi*, the Examiner construed the phrase "moving along a trajectory" in the Image Frames Limitation to include "moving along some path that is not known beforehand." RAN 27 (citing Merriam Webster's Collegiate Dictionary 1252 (10th ed. 1997); the '316 patent, Fig. 9). The Examiner states

"[t]rajectory means a path, progression, or line of development . . . There is no requirement for the trajectory to be a known or preplanned path." *Id.*

Requester finds that the Examiner correctly construed the term "trajectory." 3PR Appeal Br. 18 (citing RAN 23); *id*. at 18–20.[10] "Patent Owner [also] agrees that the 'trajectory' need not be preplanned." PO Appeal Br. 17. We agree with both parties and the Examiner that the recited "trajectory" in canceled claim 1 need not be preplanned.

Although agreeing that the "trajectory" is not preplanned, Patent Owner contends "the trajectories of the image acquisition device are known." PO Appeal Br. 17. Requester disagrees. 3PR Resp. Br. 18. Focusing on the term "moving" within the phrase "moving along a trajectory," Patent Owner also argues "'trajectory' refers to the path of a moving object. A stationary object has no trajectory." *Id.* at 16 (citing Merriam Webster's Collegiate Dictionary 1252 (10th ed. 1997)).

We agree with Requester that canceled claim 1 does not recite moving along a *known* trajectory. *See* 3PR Resp. Br. 18. Also, the '316 patent describes a trajectory to be synonymous with a path. The '316 patent 3:56 (describing cameras "moving along a trajectory/path."). The '316 patent further provides an "illustration of a trajectory" in Figure 9 where a camera is moved along a path (e.g., 110 including streets or blocks) making turns at intersections and circling around streets. *Id.* at 3:14–15, 7:58–64, Fig. 9.

[10] Requester notes that the Examiner took a contrary position in Control Nos. 95/000,681 and 95/000,682, where the Examiner found the Image Frames Limitation "require an image recording device to move a long a specified trajectory, i.e., a trajectory that is known or preplanned." 3PR Appeal Br. 19 (bolding omitted).

Although the path of streets in this example (e.g., 110 in Figure 9) may have been determined prior to recording, we note that, when driving down a street, there exists a level of randomness, such as lane shifting, which deviates from any purported, known path. Furthermore, the Figure 9 example in the disclosure is described as "an illustration" of a trajectory, whereas the claim's scope is not limited to this illustration. *Compare* the '316 patent 15:51–53, *with id.* at 3:14–15 (stating "FIG. 9 is an illustration of a trajectory"), 7:58–64 (describing Figure 9).

In summary, the phrase "wherein the images are associated with image frames acquired by an image recording device moving along a trajectory" in canceled claim 1 requires that the image recording device moves along a path, course or route, but that the path need not be known or preplanned, and that the image recording device acquires "[the] plurality of images" that "are associated with image frames acquired by an image recording device" (1) while moving and (2) both while moving and while stationary, as long as some image frames are acquired while the image recording device is moving.

2. Composite Image of Claims 13, 18, and 23

Claim 13 depends from claim 1 and recites "a composite image created by processing pixel data of a plurality of the image frames." The '316 patent 16:37–39. Claims 18 and 23 indirectly depend from claim 1 and recite similar limitations to claim 13. *Id.* at 16:56–58, 17:14–17.

The Examiner finds the phrase, "composite image," includes combining four images into a single image. *See* RAN 29–30 (incorporating Requester's November 25, 2013 Comments ("3PR Nov. 2013 Comments")

on pages 17 through 19). In the incorporated comments, Requester states that (1) Yee's four-view images are composite images under the broadest reasonable interpretation standard; (2) Yee does not use "composites" to refer to "side-by-side views" but rather composites of any of a "street view" or "curbside view" for example; and (3) the recited "composite image" does not require a single, new view. *See* 3PR Nov. 2013 Comments 17–19 (citing Yee 389); *see also* 3PR Resp. Br. 8–9.

Patent Owner disputes how for the recited "composite image" is construed. PO Appeal Br. 17–21; PO Reb. Br. 7–10. Patent Owner argues that:

> The composite image depicts a single new view of the objects in the geographical area. The single new view is different from any of the views depicted in any one of the image frames from which the composite image is created, *e.g.*, it can be a wider view. Moreover, the new view is from a single location as if the viewer was at that location.

PO Appeal Br. 17; *see also id.* at 19; PO Reb. Br. 7–8. Patent Owner cites to Figure 2 of the '316 patent and composite image 40 to support its position. PO Appeal Br. 17–18. Patent Owner also contends that "[n]othing in the '316 patent suggests that two or more . . . images depicting separate and distinct views of different objects is a 'composite image' as used in the '316 patent simply because they are displayed simultaneously on a screen." *Id.* at 21.

When considering the disclosure, the '316 patent discusses creating "composite images" by synthesizing images, image data, or image frames but does not address how the images are synthesized or combined. *See* the '316 patent, code (57), 2:20–22, 2:33–35, 3:46–49, 5:45–47. This disclosure

also states image data from each selected image frame 42 is extracted and combined to form the composite image. *Id.* at 5:66–6:1. Although the '316 patent provides a preference as to how to create a composite image (*see id.* at 6:1–6), we decline to import this particular preference into the recitation "composite image," which fails to recite the image is created "on a column-by-column basis" (*id.* at 6:4) or any of the other features of this preferred image creation process (*see id.* at 6:1–15).

Also, the plain and ordinary meaning of "composite" includes "something that is made up of different parts."[11] A single image consisting of data from four reduced image frames is something made from different parts (e.g., a composite). An ordinary meaning of (1) "synthesize"[12] includes "to make (something) by combining different things" or "to combine (things) in order to make something new," and (2) "combine,"[13] includes "to unite into a single number or expression." Thus, the phrase "composite image," consistent with the disclosure and its ordinary meaning, should be construed to mean a single image created by combining different image data or by uniting image data.

The Federal Circuit agreed with this claim construction in *Vederi*, determining the term "composite image," similar to that found in claims 13,

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[11] *Composite* (noun), Merriam-Webster's Online Dictionary, *available at* http://www.merriam-webster.com/dictionary/composite.
[12] *Synthesize*, Merriam-Webster's Online Dictionary, *available at* http://www.merriam-webster.com/dictionary/synthesize.
[13] *Combine*, Merriam-Webster's Online Dictionary, *available at* http://www.merriam-webster.com/dictionary/combine (def. 1c).

18, and 23 of the ’316 patent, can reasonably be construed to include “a single image created by combining different image data or by uniting image data.” *Vederi*, 813 F. App’x at 503 (citing the ’025 patent, 5:66–6:1). The court also stated “[w]e are not persuaded by Vederi’s argument” that limits the claimed “‘composite image’ to ‘a new image . . . that depicts a single new view (from a single location) of the objects in the geographical area that is different from any of the views depicted in any one of the image frames from which the composite image is created.’” *Vederi*, 813 F. App’x at 503 (quoting both the ’025 patent, 5:66–6:1 and *Personalized Media Commc’ns, LLC v. Apple Inc.*, 952 F.3d 1336, 1343 (Fed. Cir. 2020)).

Accordingly, the recited “a composite image” in claims 13, 18, and 23 does not require the composite image to be an image having a single view from one location, a new view, a different view, or a wider field of view than any acquired image frame as argued by Patent Owner. Stated differently, “although the specification often describes very specific embodiments of the invention, [the Federal Circuit] ha[s] repeatedly warned against confining the claims to those embodiments.” *Phillips*, 415 F.3d at 1323 (citing *Nazomi Commc’ns, Inc. v. ARM Holdings, PLC*, 403 F.3d 1364, 1369 (Fed. Cir. 2005); *Liebel-Flarsheim Co. v. Medrad, Inc.*, 358 F.3d 898, 906–08 (Fed. Cir. 2004)). We thus will not confine our understanding of the phrase, “composite image” found in claims 13, 18, and 23, to the exact representations in the Specification.

Patent Owner also discusses the ’316 patent’s Figure 2 as a composite image having “pixel values that are computed from pixel values of each of the image frames from which the composite image is created.” PO Appeal

Br. 18. Patent Owner further refers to the district court proceeding, *Vederi, LLC v. Google Inc.*, Case No. 2:10-CV-07747 (C.D. Cal.). *Id.* at 17 n.1. According to Patent Owner, Patent Owner and Requester in that proceeding agreed that a "a composite image created by processing pixel data of a plurality of the image frames" means "an image formed by combining two or more image frames at the pixel level." *Id.; see id.* at 18–19 (discussing the '316 patent, Fig. 2 computes its pixel values "from pixel values of each of the image frames").

The court in *Vederi* found the phrase "by processing pixel data of a plurality of the image frames," similar to that found in claims 13, 18, and 23 of the '316 patent, specifies "the image may be achieved by combining or uniting image data, meaning at the level of pixel data." *Vederi*, 813 F. App'x at 503 (citing the '025 patent, 19:6–14). But, this recitation does not recite *how* the pixel data of the images frames are processed, such that pixel values of the composite image are computed from pixel values of two or more image frames. We stress that the '316 patent states a *preference* for the composite image to be created by extracting image data from each image frame on a column-by-column basis. *See* the '316 patent, code (57), 6:1–15, Fig. 2. But, applying the ordinary meaning of "processing," claim 13 requires no more than "combining or uniting image data, meaning at the level of pixel data." *Vederi*, 813 F. App'x at 503.

Accordingly, the limitation of "a composite image created by processing pixel data of a plurality of the image frames" in claim 13, and similarly recited in claims 18 and 23, means a single image that may be

created by combing or uniting image data from a plurality of image frames at the level of pixel data.

3. Arbitrary Address Limitation of Claim 20

Claim 20 depends from claim 1 and further recites "the first location specified by the first user input is an arbitrary address entered via the first user input, the entered arbitrary address specifying information selected from a group consisting of street name, city, state, and zip code" ("the Arbitrary Address Limitation"). The '316 patent 16:62–66. The Examiner determines that an "arbitrary address" does not require a database having images of both assigned and unassigned addresses, but "means arbitrary to someone's perspective and that perspective may broadly and reasonably belong to a user." RAN 30. Requester further asserts that an "arbitrary address" includes "an address selected from a group of addresses." 3PR Resp. Br. 9 (citing ACP 24); *see also* 3PR Reb. Br. 2–3.

Patent Owner, on the other hand, argues that the recited "arbitrary address" means "any potential addresses (assigned and unassigned) in the geographic area, not preselected or constrained by the system." PO Appeal Br. 21. Patent Owner argues that the ordinary meaning and the '316 patent's disclosure support this understanding. *Id.* at 22–23 (citing the '316 patent 2:45–49, 6:37–47, 7:15–20, 13:21–14:14). We disagree with Patent Owner.

First, cited column 7 of the '316 patent does not discuss arbitrary addresses but rather "an arbitrary value" for a time phase. The '316 patent 7:15–20, *cited at* PO Appeal Br. 22. When discussing entering and specifying an address, the Specification of the '316 patent does not mention that the address is arbitrary or unassigned by the system (*see* the '316 patent

11:45–46) as Patent Owner contends. *See* PO Resp. Br. 6–7. Rather, the ’316 patent discusses entering “an address of the location”— not some random address—and returning a map corresponding to the address. The ’316 patent 11:45–46, 12:20–22, 12:32–35, 13:23, 13:28–29. Column 2, lines 45 through 49 cited by Patent Owner also does not describe selecting a potential address without one-to-one correspondence as argued. *See* PO Appeal Br. 22 (citing the ’316 patent 2:45–49). Cited portions (column 13, line 21 through column 14, line 14) by Patent Owner similarly do not describe a user entering an address “regardless of whether that address actually exists.” *See id.* at 23 (citing the ’316 patent 13:21–14:14). Furthermore, the cited passage in column 6 by Patent Owner does not address the recited “arbitrary address,” but rather discusses segmenting a trajectory taken by a recording camera and generating images depicting portions of the segment. *See id.* (citing the ’316 patent 6:37–47).

Second, one ordinary meaning of “arbitrary”[14] includes those based on the user’s preference or convenience. Thus, an ordinary understanding of “arbitrary address” includes an address selected by users based on their preferences or convenience. Also, although Patent Owner provides an alternative ordinary meaning of “arbitrary *somethin*g” to “refer[] to any member of a set of potential or possible ‘*somethings*’” (PO Appeal Br. 22), Patent Owner provides no supporting evidence of this understanding,

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[14] *Arbitrary*, Merriam-Webster Online Dictionary, *available at* https://www.merriam-webster.com/dictionary/arbitrary (def. 1b) (defining “arbitrary” as “based on or determined by individual preference or convenience rather than by necessity or the intrinsic nature of something”).

amounting to no more than attorney argument. *See In re Geisler*, 116 F.3d 1465, 1470 (Fed. Cir. 1997); *see also In re Pearson*, 494 F.2d 1399, 1405 (CCPA 1974) (attorney argument is not evidence). Likewise, Patent Owner asserts that the district court construed the term "arbitrary" to mean "assigned and unassigned addresses" without supporting evidence. *See* PO Appeal Br. 21–22. Moreover, claim 20 does not recite showing an image of the location along a street where the address would be located "[i]f the selected address does not correspond to an address assigned to an actual building" as argued. *Id.* at 22.

Based on the record, we agree that the recited "arbitrary address" in claim 20 does not "exclude pre-selected or assigned addresses" (3PR Reb. Br. 3) and can include "one from the group of tagged images" (RAN 30). We disagree that the phrase "arbitrary address" in claim 20 must be any potential addresses (assigned and unassigned) in the geographic area, which is not constrained by the system as Patent Owner argues. *See* PO Appeal Br. 22–23. Accordingly, we determine "an arbitrary address entered via the first user input," as claim 20 recites, can be various addresses, including an assigned address and an address selected from a group associated with tagged images.

B. Pending Rejections

Claim 13 is rejected under 35 U.S.C. § 102(a) based on (1) Dykes, (2) Al-Kodmany, and (3) Bates. RAN 6–12. Claims 13 and 18–24 are rejected under 35 U.S.C. § 103(a) based on: (4) Yee and Dykes, (5) Murphy and Yee, and (6) Shiffer and Yee. RAN 12–19. These rejection were presented on the claims as amended and prior to the '316 patent's expiry. We reverse the

rejections given the particular circumstances of this proceeding, which include that the dependencies of the claims have changed since the ’316 patent’s expiry, the Federal Circuit provided intervening claim construction for claim terms in the ’025 patent, and the claims are now construed under *Phillips* as opposed to the broadest reasonable construction. *Compare Phillips*, 415 F.3d at 1312–13, *with Personalized Media Commc’ns*, 952 F.3d at 1340.

C. New Ground of Rejection

Pursuant to 37 C.F.R. § 41.77(b), we present a new ground of rejection for claims 13 and 18–24 under 35 U.S.C. § 103(a) based on Yee, Lachinski, and Dykes.

We note that Patent Owner argues that the citation to Lachinski by Requester is improper and should be excluded from consideration because Lachinski was “introduced . . . for what Lachinski discloses in itself; it is not explaining another reference.” PO Appeal Br. 30; *see also id.* at 30–31; PO Reb. Br. 10–11. Requester contends that its reliance on and discussion of Lachinski is proper under 37 C.F.R. § 1.948(a)(2). *See* 3PR Resp. Br. 21–22 (contending Lachinski was cited to explain Yee’s teachings, including its mobile mapping system) (citing May 22, 2013 3PR Comments 27); *see also* RAN 20. But, the propriety of whether a reference was properly submitted under § 1.948 is a petitionable matter. Because this issue is not appealable, the Board lacks jurisdiction to decide this issue. *See* MPEP §§ 1002 and 1201; *see also In re Hengehold*, 440 F.2d 1395, 1403 (CCPA 1971) (stating that there are many kinds of decisions made by examiners, “which have not been and are not now appealable to the board or to this court when they are

not directly connected with the merits of issues involving rejections of claims, but traditionally have been settled by petition to the Commissioner").

Nonetheless, we underscore here that "should the Board have knowledge of any grounds not raised in the appeal for rejecting any pending claim, it may include in its opinion a statement to that effect with its reasons for so holding, which statement shall constitute a new ground of rejection of the claim." 37 C.F.R. § 41.77(b).

1. All Claims (Claims 13 and 18–24)

Because claims 13 and 18–24 ultimately depend from canceled claim 1, and thus, each of these claims includes the limitations found in canceled claim 1, we adopt the findings and conclusions related to claim 1 in the Request and by the Examiner for claims 13 and 18–24. *See* Request 98–107 (citing Yee 389–92; Dykes 136–37, 139–41, 144, Fig. 4; Ex. CC-D; Ex. OTH-B 59:18–19, 104:16–20; Ex. OTH-D 17:7–9), Ex. CC-D 1–8 (citing Yee 389–92; Dykes 136–37, 139–41, 144, Fig. 4; Ex. OTH-B 59:18–19, 104:16–20; Ex. OTH-D 17:7–9); *see also* RAN 12–15 (citing Yee 389, 391–92, Fig. 1; Dykes 139–40) (incorporating and adopting Request 98–128 and Exhibit CC-D).

Patent Owner does not dispute that Yee discloses the recitation the Image Frames Limitation found in canceled claim 1. *See* PO Appeal Br. 31–34; *see also* 3PR Resp. Br. 2 (referring to the "Image Frames Limitation"). We emphasize for completeness, that Yee discloses image frames captured while an image recording device moves along a trajectory. Yee 389–91 (discussing a van collecting street and object data while the van moves down

the road); *see also* 3PR Resp. Br. 13 (citing Yee 388–89) (stating Yee's GeoVan records as the van "is driven on streets").

2. Claims 13, 18, and 23 – a Composite Image

Claim 13 depends from claim 1 and adds "the first image is a composite image created by processing pixel data of a plurality of the image frames" (the '316 patent 16:37–39), which we have construed to mean a single image that may be created by combining or uniting image data from a plurality of image frames at the level of pixel data. Claims 18 and 23 recite similar recitations. The '316 patent 16:56–58, 17:14–16. Along with the above discussion adopting the noted findings and conclusions related canceled claim 1, we further adopt the findings and conclusions presented by Requester when addressing claims 13, 18, and 23. Request 112–13 (citing Yee 389; Ex. CC-D), 117–19 (citing Yee 389; Dykes 134–35, Fig. 2), 126–27 (citing Yee 389); *see also* Ex. CC-D 12 (citing Yee 389), 16–17 (citing Yee 389; Dykes 134–35, Fig. 2), 24 (citing Yee 389); 3PR Resp. Br. 11–12 (addressing the "composite image" limitation) (citing Dykes 140, 146), 13–15 (further citing Yee 388–89, 391–92; Lachinski 5:25–40, 10:37–11:34; ACP 12–13, 23–24; Request 98–99).

Patent Owner argues that the Examiner has relied upon Yee to define the term "composites" and change the meaning of this term. PO Appeal Br. 19–20; PO Reb. Br. 8–9. Specifically, Patent Owner contends that Yee uses the term "composite" improperly to include side-by-side views and 4-views. PO Appeal Br. 20 n.2 (citing a GeoSpan brochure[15]); *see also id.* at

[15] Patent Owner refers to "the Geospan Brochure" as Exhibit C filed January 2, 2013. However, our records indicate Exhibit C was filed January 8, 2013

20–21. Patent Owner asserts that the '316 patent requires the composite image be a single view and not "two or more separate and independent images depicting separate and distinct views of different objects." *Id.* at 21; *see also id.* at 32; PO Reb. Br. 13–14.

We find these arguments unavailing. As discussed above in Section (III)(A)(2), the court in *Vederi* agreed with our construction of the phrase "composite image" to mean a single image created by combining different image data or by uniting image data. *See Vederi*, 813 F. App'x at 503. This construction does not require a single, new view as argued (PO Appeal Br. 17). *See* 3PR Resp. Br. 14. Moreover, as for the remaining phrase that the "image [is] created by processing pixel data of a plurality of the image frames," we determined that the recitation does not recite how the pixel data of the images frames are processed, such that pixel values of the composite image are computed from pixel values of two or more image frames. Rather, claim 13 requires only combining *or* uniting image data from a plurality of image frames at the level of pixel data to create the recited "composite image."

Based on this understanding, Yee teaches or suggests the recited "composite image" limitation in claims 13, 18, and 23. Yee addresses collected data made available with its product. Yee 389. The data includes provided various views, including "curbside view, front and back," "street view, front and back," "real estate view left and right," "real estate and addresss [sic] zoom, 4-view," *and* "composites of them." *Id.* Yee explicitly

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as part of an Amendment submitted by Patent Owner and is entitled "Drive around town on your PC with GEOVISTA – *Visual Geographic Information*" ("GeoSpan brochure").

discloses "composites" (*id.*); and "them" refers back to the other discussed views, including a curbside view, a street view, and a real estate view. Thus, Yee teaches creating "composites" of these various views. For example, a composite in Yee may combine or unite image data from (1) the curbside view and the street view or (2) two different street views to produce the disclosed "composite[] of them." *Id.*; *see also* RAN 30 (discussing synthesizing a curbside view with a front and back view). Additionally, an ordinarily skilled artisan would have recognized Yee's disclosed "composites" (*see* Yee 389) would have involved combining or uniting the noted views at the level of pixel data in some manner so as to form the composites available to the user in Yee.

Patent Owner argues that Yee's "composite" would be a side-by-side view or "a 4-view display" (PO Appeal Br. 20 n.2 (citing January 8, 2013 Reply, Ex. C[16])) and not "a *single view* of objects . . . where the composite image is synthesized from multiple images" (*id.* at 21). *See also id.* at 20–21; PO Reb. Br. 13–14. We are not persuaded because the language "composite of them" in Yee *is separate from* the "4-view." Yee 389 (discussing a "real estate and address[] zoom, 4-view" separate from "composites of them").

As for the "4-view" example in Yee, Yee does not provide details concerning how the view is formed. *Id.* Even so, Patent Owner presumes the example from "the GeoSpan Brochure" is the only "4-view" that Yee envisions and argues this is not "a 'composite image created by processing

[16] This exhibit, referred to as "the GeoSpan Brochure" (*id.* at 20 n.2), was not included with Patent Owner's Appeal Brief.

pixel data of a plurality of image frames.'" PO Appeal Br. 20–21, 32. Patent Owner further relies on an example in Lachinski[17] when arguing that Yee's "4-view" is not a composite image as recited. *Id.* at 32.

We are not persuaded. The view in the described GeoSpan Brochure is just one image example of data acquired by GeoSpan Corporation discussed in Yee. *See, e.g.*, Yee 389 (describing that data collected). As noted above, Yee separately teaches the collected data includes *composites* of different views, which refer back to the various described views (e.g., curbside, street, and real estate views) (Yee 389), which at least suggest to an ordinarily skilled artisan that each of Yee's "composites of them" is a single image that may be created by combining or uniting image data from a plurality of image frames (e.g., street and curbside views) at the level of pixel data, as we construed the phrase "composite image" in Section (III)(A)(2).

Nonetheless, some similarities exist between what is shown in Patent Owner's example of Yee's 4-view (PO Appeal Br. 20) and what Yee and Lachinski disclose. Yee discusses "images can be displayed as rolling video of four views in a frame." Yee 392. Lachinski further states:

> The four-view generator 62 has four inputs 82, allowing signals from four of the video cameras 50 to be input simultaneously. The generator 62 reduces the image represented by each signal to one-fourth of its original size and then *combines the reduced images to form a single video image* by placing each of the reduced images into one of the four corners of an output image.

[17] Notably, Patent Owner disputes whether Lachinski should be considered. *Id.* at 30–31.

Lachinski 5:25–31 (emphasis added), *cited in* 3PR Resp. Br. 13; Fig. 3. This supports that the "4-view" discussed in Yee (Yee 389) is produced as a single image that combines four reduced images, one in each of four corners that is reduced in size. Lachinski 5:25–31; Fig. 3. As such, combining Lachinski's teaching with Yee, Yee's 4-view image yields a single image that combines image data from a plurality of image frames (e.g., four reduced images).

Moreover, Yee teaches that data from the four images, which include their pixel data, are used to create the reduced-sized images. Each of the "four views in a frame" discussed in Yee (Yee 392) or the "single video image" with four-views, each one-fourth of its original size that form "reduced images," as further explained in Lachinski (Lachinski 5:25–31), is a single image that is made up of different parts or image frames (e.g., image data from multiple views) and combines pixel image data from each of the different view image frames collectively to create the taught single 4-view image. Yee, as evidenced by Lachinski, teaches yet another example of "a composite image" as claims 13, 18, and 23 recite and as we construed this phrase in Section (III)(A)(2).

Patent Owner further argues that Yee's composite "teaches away from creating composite images with its process." PO Appeal Br. 32–33. This argument contrasts with Yee's explicit disclosure of a process that creates "composites" from collected data. Yee 389. Also, Patent Owner contends that Yee, including its GeoSpan system, would involve "manually review[ing] the raw image frames," "select[ing] the most appropriate image," and "add[ing] the step of creating composite images," which would

amount to "multipl[ying] the manual labor costs, greatly slow[ing] the process, and add[ing] another level of complexity." PO Appeal Br. 33; *see also id.* at 32–34[18]; PO Reb. Br. 14–15. There is insufficient evidence in the record for these assertions. In any event, the limitation "a composite image created by processing pixel data of a plurality of the image frames" in claim 13 does not exclude inputting some data manually, and many of the disputed features (e.g., slow, cost, precision, complexity) (PO Appeal Br. 32–33) are not commensurate in scope with claims 13, 18, and 23. Also, Lachinski, which addresses a GeoSpan system having similarities to Yee, discusses that a manual process is *not* used to generate composites. Lachinski 5:25–40 (discussing using generator 62 to form a single video image), *cited in* 3PR Resp. Br. 14.

Patent Owner further argues that Requester did not provide a motivation to combine Yee with Dykes (PO Appeal Br. 31) and one skilled in the art would not have combined Dykes with Yee to arrive at claim 13's invention (*id.* at 32, 34). *See also* PO Reb. Br. 14. Patent Owner asserts Dykes concerns 360 degree panoramas and thus does not teach "the desirability of acquiring image frames for creating composite images 'by an image recording device moving along a trajectory.'" PO Appeal Br. 32. Patent Owner contends that Dykes does not cure the deficiencies of Yee and "there is no rational reason why a person of skill in the art would have

[18] Patent Owner footnotes a reference entitled "GEN-2 City Tour BBC & CNBC 1995, January 1, 2004" and states the reference was submitted January 7, 2013. We are not able to locate this reference but did locate a reference entitled "City Tour – User Guide and Tutorial," submitted January 8, 2013, copyrighted 1996 by GEOSPAN Corporation. However, this evidence was not part of Patent Owner's Appeal Brief.

combined Yee and Dykes to arrive at the embodiment of claim[] 13." PO Appeal Br. 34.

As for motivation, the Request explains "Yee discloses a mobile mapping system for recording images of a geographic area a visual interface system (VIS) for an end user to locate and retrieve the collected video images," "Dykes discloses plotting symbols on a map to represent the locations where panoramic images are available," and "Dykes' teachings provide a spatial interface for an end user to locate and retrieve panoramic images." Request 99. Based on these teachings, the Request explains one skilled in the art would have been "motivated to combine the teachings put forward by Yee and Dykes to provide a system and method that enables a user to navigate locations by visualizing the locations spatially as presented by symbols on a map." *Id.* at 99–100; *see also* RAN 13–15 (citing Request 98–100; Dykes 139–40); 3PR Resp. Br. 14–15 (citing Request 98–99; Yee 391–92; Dykes 139–40; ACP 12–13, 24). We thus disagree that Requester did not provide a reason with a rational underpinning to combine Yee with Dykes.

Also, contrary to Patent Owner's assertion, Yee is not deficient in teaching "a composite image" as claims 13, 18, and 23 recite. Nonetheless, presuming, without agreeing, that Yee and Lachinski do not teach the recited "composite image," Dykes teaches another known technique for creating "composites" by combining and uniting images (e.g., stitching) to produce a panoramic image. Dykes 132–36, Fig. 2. When substituting one known element for another known in the art (e.g., Yee's composite technique for Dykes' panoramic technique of forming a composite), "the combination

must do more than yield a predictable result." *KSR Int'l Co. v. Teleflex Inc.*, 550 U.S. 398, 416 (2007). Additionally, Dykes teaches panoramic imagery (1) can assist "with educational aims," including making more sense of maps when looking at panoramic landscape views, or with the urban planning (Dykes 134 (quoting Shiffer 365)), (2) can evoke a visual experience in an engaging virtual environment (*id.* at 136), (3) provides an ability to navigator across the virtual space and between recognized features (*id.* at 139), and (4) permits panning around the landscape and touring across its virtual environment configuration (*id.* at 140). Also, as noted above, both the Examiner and Requester have provided reasons with some rational underpinning to combine Dykes with Yee to arrive at claim 13's invention, including creating an environment in Yee's system that is easy to set up due to minimal data and metadata used. *See also* RAN 13–15 (citing Request 98–100; Dykes 139–40); 3PR Resp. Br. 14–15 (citing Request 98–99; Yee 391–92; Dykes 139–40).

Accordingly, Yee, Lachinski, and Dykes teach or suggest the "composite image" limitations in claim 13, 18, and 23.

3. Claims 18 and 19

Claims 18 and 19 ultimately depend from canceled claim 1 and add "The method of claim 17, wherein the first image is a composite image created by processing pixel data of a plurality of the synchronized image frames" and "The method of claim 18, wherein the composite image depicts a wider field of view than is depicted in any one of the plurality of the synchronized image frames" respectively. Along with the above discussion adopting the noted findings and conclusions related to canceled claim 1, we

further adopt the findings and conclusions in the Request when addressing claims 18 and 19. Request 117–21 (citing Yee 389; Dykes 134–35, Fig. 2; Ex. CC-D); *see also* Ex. CC-D 16–19 (citing Yee 389; Dykes 134–35, Fig. 2).

Additionally, Yee discusses Global Positioning System (GPS) and Geographic Information Systems working with video technology (Yee 388), its system is capable of obtaining accurate GPS positioning (*id.* at 390), and collecting and synchronizing images (*id.* at 391). Additionally, Dykes's Figure 2 and its stitching technique suggest that the acquired image frames (e.g., the nine frames in the upper-left side) are synchronized with some type of position information in order to create the continuous panorama that is properly aligned as shown in Figure 2. *See* Dykes 135, 137, Fig. 2. Combining Yee's GPS positioning/synchronizing image approach with Dykes's technique to unite (e.g., synchronized) images based on position would have assisted in and improved upon producing the continuous image (e.g., a panorama) in Dykes by using Yee's positioning data. *See KSR*, 550 U.S. at 417.

Other than the arguments discussed above related to "a composite image" found in claim 18, Patent Owner does not separately argue Requester's findings and conclusion related to claims 18 and 19. Accordingly, we determine Yee, Lachinski, and Dykes teach and suggest the recitations in claims 18 and 19.

4. Claim 20 – The Arbitrary Address Limitation

Claim 20 depends from claim 1 and adds "wherein the first location specified by the first user input is an arbitrary address entered via the first

user input, the entered arbitrary address specifying information selected from a group consisting of street name, city, state, and zip code." The '316 patent 16:62–66. For this claim, we further adopt the findings and conclusions presented by Requester when addressing claim 20. Request 121–22 (citing Yee 391–92; Ex. CC-D); *see also* Ex. CC-D 19–20 (citing Yee 391–92); 3PR Resp. Br. 15–16 (citing Yee 391–92; Lachinski 13:10–24; 14:49–58, 16:64–66, 17:14–20; ACP 24); 3PR Appeal Br. 10–11 (citing Yee 391–92, Abstract; Lachinski 16:64–66, 17:19–20; ACP 24); 3PR Reb. Br. 3–4 (citing Yee 391–92; Lachinski 16:64–66, 17:19–20).

Based on Patent Owner's argued claim construction of "arbitrary address" addressed in Section (III)(A)(3), Patent Owner argues Yee fails to disclose the recitations of claim 20. PO Appeal Br. 34–36. Specifically, Patent Owner argues that "Yee teaches only the retrieval of pre-selected addresses" or "those that have already been assigned and which have been correlated with a specific image." *Id.* at 35; *see also id.* at 34–35 (citing Yee 392); PO Reb. Br. 15; PO Resp. Br. 6. Patent Owner further argues that the GeoSpan system described in Yee involves a user selected from a list of assigned (not unassigned) addresses tagged to an image. PO Appeal Br. 35; *see also* PO Resp. Br. 6–7. Patent Owner also argues that the Yee/Lachinski's address parsing differs from the recited "arbitrary address" in claim 20 because the address parsing only involves a user-supplied address converted to a standard address by matching the address to a real address and cannot return a location corresponding to an unassigned address. *Id.* at 35–36 (citing Lachinski 16:33–17:50; ACP 21); *see also* PO Reb. Br.

15 (citing Lachinski 17:19–20) (discussing a "coordinate pair"); PO Resp. Br. 7 (citing Lachinski 16:33–17:50).

We are not persuaded. As explained above in Section (III)(A)(3), we disagree that the recited "arbitrary address" must exclude assigned addresses and include only unassigned addresses. *See* 3PR Reb. Br. 3 (noting "there is no support for limiting 'arbitrary' to exclude pre-selected or assigned addresses"). Unlike Patent Owner's assertions (*see* PO Resp. Br. 6–8), the '316 patent does not discuss that the address is arbitrary or unassigned when discussing entering an address or location into the system. For example, the '316 patent describes a user can input a particular address (e.g., location or geographic coordinates), and this address is not described as an unassigned address in the system. *See* the '316 patent 11:45–46, 12:20–26, 12:32–35, 13:21–24, 13:27–29.

Additionally, claim 20 does not recite an image database or the retrieval of an arbitrary address; thus, Yee need not disclose "the retrieval of an arbitrary address" as argued. PO Appeal Br. 35. However, canceled claim 1, from which claim 20 ultimately depends, does recite "retrieving from the image source a first image associated with the first location" that "a first user input specif[ies]." The '316 patent 15:45, 16:47–48. As previously discussed, Yee teaches this feature. *See* Request 102 (citing Yee 391–92; Ex. CC-D) (addressing Yee's Visual Interface System that retrieves images and a user can enter a street address and retrieve images related to the address); *see also* Ex. CC-D 2–3 (citing Yee 391–92). We thus determine that Patent Owner's contentions concerning the Yee system and

related documents fail to demonstrate that a user of the Yee system cannot enter an "arbitrary address" as claim 20 recites.

As for teaching the "arbitrary address" limitation, Yee discusses a "[s]treet address entry" (Yee 392), street name recording, and individually tagging addresses. *See* Yee 391–92. Yee also states that "[a] user can point at a road segment or specific location on a computerized map and instantly display the video image(s) for that selected segment." *Id.*; *see also* 3PR Reb. Br. 3 (citing Yee 391–92). Using the ordinary understanding of "arbitrary" discussed in Section (III)(A)(3), Yee's entered address is an arbitrary address because the address is based on the user's preference and convenience to enter a street address. *See* Yee 391–92. Additionally, Yee's teachings, whether the user enters the address or points to a specific location on the map, do not specify the entered address is assigned. *See id.*

Patent Owner further argues Lachinski and Dykes do not cure the purported deficiency of Yee. PO Appeal Br. 35–36. This argument is unavailing. As explained above, Yee does not have the alleged deficiency, and Dykes was not relied upon to teach the "arbitrary address" feature. Request 121–22; Ex. CC-D 19–20. However, to the extent that Requester relies on Lachinski to demonstrate claim 20's "arbitrary address" limitation (*see* 3PR Resp. Br. 15–16; *see* 3PR Reb. Br. 3–4), we agree that Lachinski further teaches a process for permitting entry of both assigned (and unassigned addresses) and thus, provides another example of "the first user input is an arbitrary address entered via the first user input" as claim 20 recites.

Specifically, Lachinski teaches a user can supply an address, and this address is converted into a standard address within its database for matching "to a real address range in the database." Lachinski 16:66; *id.* at 16:63–66. Lachinski further teaches to recall an image for "any coordinate pair" the "process allows the retrieval of the nearest video image to a coordinate pair." *Id.* at 17:19–20; *id.* at 17:15–21. When including this teaching with Yee, the Yee/Lachinski system permits a user to enter an address near or close to an address in the system (e.g., "an arbitrary address entered via the first user input") and still retrieve an image associated with the location as canceled claims 1 and dependent claim 20 collectively recite. We thus disagree with Patent Owner that Yee/Lachinski's address parsing process fails to teach or at least suggest the recited "arbitrary address" in claim 20.

Accordingly, Yee, Lachinski, and Dykes teach or suggest claim 20 "arbitrary address" limitations.

5. Claims 21–24

Claim 21 depends from claim 20 and adds:

> segmenting the trajectory on which the image recording devices move, into a plurality of segments;
> correlating the plurality of segments to a plurality of street segments in a geographic information database;
> identifying one of the plurality of street segments based on the arbitrary address;
> retrieving the first image based on the identified one of the plurality of street segments; and
> outputting the first image onto an image display device.

The '316 patent 16:67–17:9; Certificate of Correction 1. For claim 21, we further adopt the findings and conclusions presented by Requester and the Examiner when addressing claim 21. Request 123–25 (citing Yee 388–89,

391–92; Ex. CC-D); *see also* Ex. CC-D 20–22 (citing Yee 388–89, 391–92); 3PR Resp. Br. 16–18 (citing Yee 389; Lachinski 2:47–50, 3:32–37, 9:42–46, 12:52–13:2, 13:56–63, 14:46–53, 16:40–47; ACP 24–25); ACP 24–25 (citing Yee 391–392 and "Lachinski evidence"); 3PR Nov. 2013 Comments 39–42 (citing Yee, Abstract, 388–89; Lachinski 2:47–50, 3:32–37, 9:42–46, 12:52–13:2, 13:56–63, 14:46–53, 16:40–47).

Patent Owner asserts that claim 21 "describes a method whereby the houses and other structures do[not] need to be individually tagged to an image." PO Appeal Br. 37. Yet, claim 21 does not include a limitation that excludes tagging images. Also, we are not persuaded with this argument, as previously discussed, to the extent that the assertions concern the argument addressed above for claim 20 related to the recited "arbitrary address" limitation purportedly excluding tagging. *See, e.g.*, PO Appeal Br. 35–36.

By reciting "identifying one of the plurality of street segments based on the arbitrary address," Patent Owner also contends that claim 21's process associates first and second locations with a street segment and not a specific image. *Id.* at 37. Patent Owner contends Yee is deficient, and Lachinski does not disclose this step. *Id.* We disagree Yee is deficient and refer to the Examiner's and Requester's explanations. RAN 15 (incorporating and adopting the rejection in Request 123–25 (citing Yee 388–89, 391–92)); *see also* 3PR Resp. Br. 16–18 (citing Yee 389; Lachinski 2:47–50, 3:32–37, 9:42–46, 12:52–13:2, 13:56–63, 14:46–53, 16:40–47; ACP 24–25); ACP 24–25 (citing Yee 391–92). Yee explicitly discusses a user can point to a road segment or specific location on a map and image(s) are displayed for that selected segment. Yee 391–92.

Patent Owner also argues that Yee, even when supplemented by Lachinski, does not disclose "the three step retrieval process of claim 21." PO Appeal Br. 37. We find this argument unavailing given that claim 21 recites five steps and only one recited "retrieving." We are not clear as to what portion of claim 21 is the described "three step retrieval process." Other than the previously discussed argument concerning the "identifying" step and Lachinski, Patent Owner does not articulate clearly any step in claim 21 that the cited art fails to teach. *See id.* at 36–37.

In any event, we emphasized that Yee discloses images and locations are processed by GeoVan software and loaded into its Geographic Information System (GIS) systems because GeoSpan uses TIGER (Topological Integrated Geographic and Referencing) file format to record its data (e.g., images). Yee 390 (addressing using a GPS receiver for "image reference location"), 391 (addressing TIGER file format). Lachinski further explains the TIGER file format, indicating this format improves the accuracy of coordinates (e.g., identify position data) within the files and adds information (e.g., missing street and address information), which can assist in (1) identifying and updating street segments related to a location and position and (2) creating indirect relationships between the segments and images for a variety of GIS applications. Lachinski 1:15–23, 2:16–20, 2:47–50, 3:32–37, 9:36–45, 11:55–12:62, 13:56–63, 14:41–58, 16:33–17:38, Figs. 9–10.

Yee also teaches a user can point at a road segment or specific location on a map and then display an image for that segment. Yee 391–92. Lachinski discusses its street segment database can store large amounts of

image sets that can be manipulated and managed using an indexing method. Lachinski 13:51–55. Lachinski also describes a segment position "can be expressed as an absolute position in terms of video images" (*id.* at 14:46–49), making it "possible to determine the closest video image to any given segment position" (*id.* at 14:50–51). One skilled in the art would have recognized that including Lachinski's process in the Yee's system would have improved coordinate accuracy with its system, and would have permitted a large amount of images, which are associated with street segments related to locations and positions, to be stored and managed. *See KSR Int'l Co. v. Teleflex Inc.*, 550 U.S. 398, 416 (2007).

Thus, as evidenced by Lachinski above and when combined with the Yee/Dykes system, the resulting TIGER file format would have yielded a process of "segmenting the trajectory on which the image recording devices move, into a plurality of segments," "correlating the plurality of segments to a plurality of street segments in a geographic information database," "identifying one of the plurality of street segments based on the arbitrary address," "retrieving the first image based on the identified one of the plurality of street segments," and "outputting the first image onto an image display device," as claim 21 recites.

Accordingly, Yee, Lachinski, and Dykes teach or suggest claim 21 limitations.

As for claims 22–24, we further adopt the findings and conclusions in the Request when addressing claims 22–24. Request 125–28 (citing Yee 389, 391–92; Ex. CC-D); *see also* Ex. CC-D 23–24 (citing Yee 389, 391–92). Other than the arguments discussed above related to claims 20 and 21,

for which claims 21–24 ultimately depend, Patent Owner does not separately argue Requester's findings and conclusion related to claims 22–24.

Accordingly, we determine Yee, Lachinski, and Dykes teach and suggest the recitations in claims 22–24.

In sum, we newly reject claims 13 and 18–24 under 35 U.S.C. § 103(a) based on Yee, Lachinski, and Dykes.

D. Requester's Cross Appeal

Requester appeals the Examiner's decision not to adopt a proposed rejection[19] of a now improper claim (i.e., claim 42) based on Yee and Dykes. 3PR Appeal Br. 4; *see also* RAN 4. Because the appealed claim is presently improper, Requester's cross-appeal has been rendered moot.

IV. CONCLUSION

We have reviewed the entire record, including submissions by Patent Owner and Requester, and the decision in *Vederi.*

Concerning the claims rejected by the Examiner or newly proposed grounds, we determine:

Claim(s) Rejected	35 U.S.C. §	Reference(s)/Basis	Affirmed	Reversed	New Ground
13	102(a)	Dykes		13	
13	102(a)	Al-Kodmany		13	
13	102(a)	Bates		13	
13, 18–24	103(a)	Yee, Dykes		13, 18–24,	

[19] This rejection was proposed by Requester in comments after ACP on November 25, 2013. 3PR Nov. 2013 Comments 49.

13, 18–24	103(a)	Murphy, Yee		13, 18–24,	
13, 18–24	103(a)	Shiffer, Yee		13, 18–24	
13, 18–24	103(a)	Yee, Lachinski, Dykes			13, 18–24
Overall Outcome				13, 18–24	13, 18–24

V. TIME PERIOD FOR RESPONSE

This decision contains a new ground of rejection pursuant to 37 C.F.R. § 41.77(b). Section 41.77(b) provides that "[a] new ground of rejection . . . shall not be considered final for judicial review."

Section 41.77(b) also provides that Patent Owner, within one month from the date of the decision, must exercise one of the following two options with respect to the new grounds of rejection to avoid termination of the appeal proceeding as to the rejected claims:

> (1) *Reopen prosecution.* The owner may file a response requesting reopening of prosecution before the examiner. Such a response must be either an amendment of the claims so rejected or new evidence relating to the claims so rejected, or both.
>
> (2) *Request rehearing.* The owner may request that the proceeding be reheard under § 41.79 by the Board upon the same record. The request for rehearing must address any new ground of rejection and state with particularity the points believed to have been misapprehended or overlooked in entering the new ground of rejection and also state all other grounds upon which rehearing is sought.

In accordance with 37 C.F.R. § 41.79(a)(1), the "[p]arties to the appeal may file a request for rehearing of the decision within one month of the date of: . . . [t]he original decision of the Board under § 41.77(a)." A request for rehearing must be in compliance with 37 C.F.R. § 41.79(b). Comments in opposition to the request and additional requests for rehearing must be in accordance with 37 C.F.R. § 41.79(c)-(d), respectively. Under 37 C.F.R. § 41.79(e), the times for requesting rehearing under paragraph (a) of this section, for requesting further rehearing under paragraph (c) of this section, and for submitting comments under paragraph (b) of this section may not be extended.

An appeal to the United States Court of Appeals for the Federal Circuit under 35 U.S.C. §§ 141-144 and 315 and 37 C.F.R. § 1.983 for an *inter partes* reexamination proceeding "commenced" on or after November 2, 2002 may not be taken "until all parties' rights to request rehearing have been exhausted, at which time the decision of the Board is final and appealable by any party to the appeal to the Board." 37 C.F.R. § 41.81. *See also* MPEP § 2682.

No time period for taking any subsequent action in connection with this appeal may be extended under 37 C.F.R. § 1.136(a)(1)(iv).

Requests for extensions of time in this proceeding are governed by 37 C.F.R. §§ 1.956 and 41.79(e).

In the event neither party files a request for rehearing within the time provided in 37 C.F.R. § 41.79, and this decision becomes final and appealable under 37 C.F.R. § 41.81, a party seeking judicial review must

timely serve notice on the Director of the United States Patent and Trademark Office. *See* 37 C.F.R. §§ 90.1 and 1.983.

REVERSED
37 C.F.R. § 41.77

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Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

PTOL-90A (Rev. 04/07)

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

GOOGLE INC.
Requester,

v.

Patent of VEDERI, LLC.
Patent Owner

Appeal 2018-007745
Reexamination Control 95/000,684
Patent 7,813,596 B2
Technology Center 3900

Before DENISE M. POTHIER, ERIC B. CHEN, and IRVIN E. BRANCH, *Administrative Patent Judges*.

POTHIER, *Administrative Patent Judge*.

DECISION ON APPEAL

I. STATEMENT OF CASE

This proceeding returns to us on remand from the Federal Circuit, vacating our previous decisions for this proceeding mailed August 15, 2016, September 28, 2018, and February 1, 2019. *See Vederi, LLC v. Google LLC*, 813 F. App'x 499, 501, 505 (Fed. Cir. 2020).

As background, Requester requested an *inter partes* reexamination ("the Request") of U.S. Patent No. 7,813,596 ("the '596 patent"). The '596 patent

claims priority to U.S. Applications: (1) 11/761,361 (now U.S. Patent No. 7,577,316), filed June 11, 2007, (2) 11/130,004 (now U.S. Patent No. 7,239,760), filed May 16, 2005, and (2) 09/758,717 (now U.S. Patent No. 6,895,126), filed on January 11, 2001. The '596 patent, code (60). Pursuant to 35 U.S.C. § 154(a)(2), the term of the '596 patent ended twenty (20) years from the filing date (i.e., January 11, 2001) of the earliest application for which a benefit is claimed under 35 U.S.C. §§ 120 and 121. *See* 35 U.S.C. § 154(a)(2) (2013); *see also* the Manual of Patent Examining Procedure (MPEP) § 2701(I). Thus, the '596 patent expired on January 11, 2021.[1]

"No amendment may be proposed for entry in an expired patent." 37 C.F.R. § 1.530(j); *see also* 37 C.F.R. § 1.121(j) (referring to § 1.530). That is, "[a]lthough the Office actions will treat proposed amendments [during a reexamination proceeding] as though they have been entered, the proposed amendments will not be effective until the reexamination certificate is issued and published." 37 C.F.R. § 1.530(k). Notably, "no amendment, other than the cancellation of claims, will be incorporated into the patent by a certificate issued after the expiration of the patent." 37 C.F.R. § 1.530(j).

Accordingly, the reexamination proceeding will now be based on the original patent claims of the '596 patent. Patent Owner's proposed amendments (*see, e.g.,* the January 3, 2013 Amendment ("Jan. 2013 Amendment")) to the claims, including new claims 63–75 (Jan. 2013 Amendment 15–17; PO Reopen Request 19), are thus improper at this time. *See* MPEP § 2666.01. On the other

[1] The MPEP states the Office should "refuse to express to any person any opinion as to . . . the expiration date of any patent, *except to the extent necessary to carry out*: . . . (C) a . . . *reexamination proceeding to reexamine the patent.*" MPEP § 1701 (9th ed. rev. 10.2019 June 2020) (emphases added).

hand and even though the ’596 patent has expired, Patent Owner’s proposed claim amendments to cancel claims 1, 2, 10, 15, 16, 20, 23, 35, 40, 45, and 50 (*see* Jan. 2013 Amendment 4–7, 10–12) are permitted. *See* MPEP § 2666.01. Additionally, claims 3, 5–9, 11–14, 17–19, 22, 24–34, 36–39, 41–44, 46–49, and 51–62 are not subject to reexamination. *See* RAN 1 (box 1b).[2] Based on the foregoing, the reexamination proceeding will be based on original patent claims 4 and 21.

Upon review, we REVERSE the rejections adopted by the Examiner but present new grounds of rejection for patent claims 4 and 21 pursuant to 37 C.F.R. § 41.77(b).

Related Matters

The parties indicate that the ’596 patent was the subject of the following litigation: *Vederi, LLC v. Google Inc.*, Case No. 2:10-CV-07747 (C.D. Cal.), *Vederi, LLC v. Google Inc.*, Case Nos. 13-1057, and *Vederi, LLC v. Google Inc.,* Case No. 13-1296.[3] PO Appeal Br. 2; 3PR Appeal Br. 1, 20–21, Related

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[2] Throughout this Opinion, we refer to: (1) the Action Closing Prosecution (ACP) mailed September 24, 2013, (2) the Right of Appeal Notice (RAN) mailed June 4, 2014, (3) Patent Owner’s Appeal Brief (PO Appeal Br.) filed September 3, 2014, (4) Requester’s Respondent Brief (3PR Resp. Br.) filed October 2, 2014, (5) Patent Owner’s Rebuttal Brief (PO Reb. Br.) filed May 22, 2015, (6) the Requester’s Appeal Brief (3PR Appeal Br.) filed September 8, 2014, (7) the Examiner’s Answer (Ans.) mailed April 21, 2015, (8) Patent Owner’s Request to Reopen Prosecution (PO Reopen Request) filed September 16, 2016, (9) the Examiner’s Determination Under 37 C.F.R. 41.77(d) (Ex. Deter.) mailed May 17, 2018, and (10) the Request for *Inter Partes* Reexamination (“Request”) filed August 17, 2012.

[3] Cases Nos. 13-1057 and 13-1296 were decided on March 14, 2014 and concerned U.S. Patent Nos. 7,577,316 B2, 7,805,025 B2, and 7,239,760 and the ’596 patent. *Vederi, LLC v. Google, Inc.*, 744 F.3d 1376 (Fed. Cir. 2014). The Federal Circuit reversed the claim construction of the district court, vacated the judgement, and

Proceedings App. Additionally, the parties indicate that this appeal may be related to: (1) U.S. Patent No. 7,805,025 B2, which is the subject of *inter partes* reexamination having been assigned Control No. 95/000,681, (2) U.S. Patent No. 7,239,760 B2, which is the subject of *inter partes* reexamination having been assigned Control No. 95/000,682, and (3) U.S. Patent No. 7,577,316 B2, which is the subject of *inter partes* reexamination having been assigned Control No. 95/000,683. PO Appeal Br. 2; 3PR Appeal Br. 1. The opinions in these proceedings were similarly vacated. *Vederi*, 813 F. App'x 501.

Parties Appeals

Patent Owner appealed the decision in the RAN rejecting claims 4 and 21. *See* PO Appeal Br. 3, 6. Requester responded, and Patent Owner rebutted.

Requester cross-appealed the decision in the RAN determining now-improper claims of the '596 patent are patentable. 3PR Appeal Br. 2. Patent Owner responded, and Requester rebutted.

The Examiner's Answer incorporated the RAN (Ans. 1), which rejected claims 4 and 21 on various grounds. RAN 1, 6–19.

An oral hearing was conducted on April 27, 2016. The transcript of the hearing has been made of record.

After the August 2016 Decision, Patent Owner requested reopening prosecution. *See* PO Reopen Request 1. The remand was granted in part for the Examiner's consideration of now-improper claims. May 23, 2017 Order 3–5. The Examiner determined that the rejections of the now-improper claims were not

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remanded for further proceedings. *See id.* at 1384; *see also* PO Appeal Br. 3. The disputed claim language addressed by the Federal Circuit in this case differs from the disputed language in the instant appeal.

overcome. Ex. Deter. 2. We, subsequently, rendered a second opinion on September 28, 2018, and a decision on rehearing on February 1, 2019.

The Federal Circuit vacated our decisions. *Vederi*, 813 F. App'x at 501. In its opinion, the court construed three phrases found in the claims of U.S. Patent No. 7,805,025 ("the '025 patent"). *Vederi*, 813 F. App'x at 501–505. These phrases are: (1) "composite image," (2) "moving" within the phrase "image frames acquired by an image recording device moving along a trajectory," and (3) "web page for the retail establishment" within the phrase "accessing a web page for the retail establishment; and invoking by the computer system a display of the web page on the display screen." The court specifically agreed with how the panel construed the phrase "composite image" (*id.* at 503), did not fully adopt how the panel construed the phrase "moving" (*id.* at 503–504), and disagreed with how the panel construed the phrase "web page for the retail establishment" (*id.* at 504–505).

Given the claim construction addressed in *Vederi*, we reevaluate the rejections of claims 4 and 21. In reaching our decision, we consider the record as a whole.

Claimed Subject Matter

Canceled claim 1 and dependent claim 4 are reproduced below:

> 1. (Canceled) In a system including an image source and a user terminal having a screen and an input device, a method for enabling visual navigation of a geographic area from the user terminal, the method comprising:
>
> receiving a first user input specifying a first location in the geographic area;
>
> retrieving from the image source a first image associated with the first location, the image source providing a plurality of images depicting views of objects in the geographic area, the views being

substantially elevations of the objects in the geographic area, *wherein the images are associated with image frames acquired by an image recording device moving along a trajectory*;

retrieving a map of at least a portion of the geographic area;

displaying the retrieved first image on a first display area of the screen and the retrieved map on a second display area of the screen;

receiving a user selection of a position on the displayed map;

determining a second location based on the user selected position; and

retrieving from the image source a second image associated with the second location.

4. The method of claim 1,

wherein the first and second images are each *a composite image*, *wherein each composite image is created by processing pixel data of a plurality of the image frames*.

The '596 patent 15:42–64 (emphasis added), 16:6–9 (emphasis added).

Prior Art Relied Upon

The record relies on the following as evidence of unpatentability:

Name	Reference	Date
Lachinski[4]	US 5,633,946	May 27, 1997
Murphy	US 6,282,362 B1	Aug, 28, 2001

[4] Requester indicates that Lachinski was cited in its Comments to rebut Patent Owner's response and to explain how Yee's four-view images are created. 3PR Resp. Br. 2, 18–19 (citing page 27 of the "May Supplemental Third-Party Comments"); *see also* RAN 19–20 (discussing Lachinski is properly cited under 37 C.F.R. §1.948(a)(2)).

Michael J. Shiffer, *Augmenting Geographic Information with Collaborative Multimedia Technologies*, 11 Proc. Auto Carto. 367–376 (1993) (“Shiffer”).

Frank Yee, *GPS & Video Data Collection In Los Angeles County: A Status Report*, Proc. IEEE Position Location and Navigation 388–393 (1994) (“Yee”).

Toru Ishida et al., *Digital City Kyoto: Towards A Social Information Infrastructure*, 1652 Lecture Notes in Artificial Intelligence from Int’l Workshop on Cooperative Info. Agents 23–35[5] (1999) (“Ishida”).

J. Dykes, *An Approach To Virtual Environments For Visualization Using Linked Geo-referenced Panoramic Imagery*, 24 Computers, Env’t & Urb. Sys. 127–152 (2000) (“Dykes”).

Kheir Al-Kodmany, *Using Web-Based Technologies and Geographic Information Systems in Community Planning*, 7 J. Urb. Tech. 1–31 (2000) (“Al-Kodmany”).

Nada Bates-Brkljac & John Counsell, *Issues in Participative Use of an Historic City Millennial Web Site*, IEEE Proc. Int’l Conf. Info. Visualization 119–125 (July 2000) (“Bates”).

Current Rejections

The Examiner rejects the claims as follows:

Reference(s)	Basis[6]	Claims	RAN
Dykes	§ 102(a)	4	6–8
Yee	§ 102(b)	4	8–10
Al-Kodmany	§ 102(a)	4	10–12

[5] Ishida is not numbered but we refer to the pages sequentially starting with page 23 like the Request. *See, e.g.*, Request 16, 212–215.

[6] The Leahy-Smith America Invents Act, Pub. L. No. 112-29, 125 Stat. 284 (2011) (“AIA”), amended 35 U.S.C. §§ 112, 102, 103, and 305. Changes to §§ 102 and 103 apply to applications filed on or after March 16, 2013. Because this application has an effective filing date before March 16, 2013, we refer to the pre-AIA versions of §§ 102 and 103.

Bates	§ 102(a)	4	12–13
Murphy and Yee	§ 103(a)	4	14–15
Shiffer and Yee	§ 103(a)	4	16–17
Ishida and Dykes	§ 103(a)	4, 21	17–19

II. MAIN ISSUE ON APPEAL

We review the appealed rejections for error based upon the issues identified by Patent Owner, and in light of the arguments and evidence produced thereon. *Cf. Ex parte Frye*, 94 USPQ2d 1072, 1075 (BPAI 2010) (precedential) (citing *In re Oetiker*, 977 F.2d 1443, 1445 (Fed. Cir. 1992)). "Any arguments or authorities not included in the brief permitted under this section or [37 C.F.R.] §§ 41.68 and 41.71 will be refused consideration by the Board, unless good cause is shown." 37 C.F.R. § 41.67(c)(1)(vii).

Based on the record, the major issue on appeal is whether, as presented, the Examiner erred in rejecting patent claims 4 and 21?

III. ANALYSIS

A. Claim Construction

As previously noted, the '596 patent has expired. Because the '596 patent has expired, we give its claims' recitations "their ordinary and customary meaning" as would have been understood by "a person of ordinary skill in the art in question at the time of the invention." *Phillips v. AWH Corp.*, 415 F.3d 1303, 1312–13 (Fed. Cir. 2005); *see also* MPEP § 2258(I)(G) (citing *Phillips*, 415 F.3d at 1316; *Ex parte Papst-Motoren*, 1 USPQ2d 1655 (BPAI Dec. 23, 1986)). Additionally, "[c]laims 'must be read in view of the specification, of which they are a part'" (*Phillips*, 415 F.3d at 1315 (quoting *Markman v. Westview*

Instruments, Inc., 52 F.3d 967, 979 (Fed. Cir. 1995) (en banc))), and "the specification 'is always highly relevant to the claim construction analysis'" (*id.* (quoting *Vitronics Corp. v. Conceptronic, Inc.*, 90 F.3d 1576, 1582 (Fed. Cir. 1996))).

The parties discuss limitations of canceled claims 1 and 15, claim 4, and claim 21 of the '596 patent in their briefings. PO Appeal Br. 6–23; *see also* 3PR Appeal Br. 16–18; 3PR Resp. Br. 2–9. Although claims 1 and 15 are canceled (*see* the Jan. 2013 Amendment 4, 6), claim 4 of the '596 patent depends from canceled claim 1 and claim 21 ultimately depends from claim 15. Thus, each appealed claim includes either canceled claim 1's or claim 15's recitations.

1. The Image Frames Limitation of Canceled Claims 1 and 15

Canceled claims 1 and 15 recite "wherein the images are associated with image frames acquired by an image recording device moving along a trajectory" (the Image Frames Limitation[7]). The '596 patent 15:52–54, 17:18–20. Patent Owner's arguments focus on the word "moving" in the Image Frames Limitation. PO Appeal Br. 8–19. Specifically, Patent Owner contends that it is unreasonable to construe this claim limitation broad enough to encompass situations where all the images are captured while the image recording device is stationary. *Id.* at 9. Patent Owner asserts that the claim term "moving" in this limitation should be given "meaning, [such that] image frames must be acquired while the recording device is in motion" (*id.*) and "along the trajectory at the time of the acquisition" (*id.* at 10). Patent Owner further argues that this understanding is the only construction consistent with the '596's patent disclosure. *Id.* at 10–17 (citing the

[7] Requester refers to the quoted limitation as "the 'Image Frames Limitation.'" 3PR Appeal Br. 16; 3PR Resp. Br. 2.

’596[8] patent, code (57), 2:27–31, 2:45–48, 3:54–60, 4:50–62, 5:18–22, 5:52–54, 6:56–62, 7:58–64, and U.S. Provisional App. No. 60/238,490 (“the ’490 provisional application”), pp. 8–9).

The Examiner and Requester disagree. RAN 21–26 (citing 3PR November 25, 2013 Comments (“3PR Nov. 2013 Comments”) 7, 9); 3PR Resp. Br. 2–7. The Examiner explains that canceled claims 1 and 15 do not recite that “[the] image frames [are] acquired by the device while moving along a trajectory (i.e., recording and moving at the same time).” RAN 21 (underlining omitted); *see id.* at 25–26 (referring to 3PR Nov. 2013 Comments 14–15). The Examiner asserts that the claims and Patent Owner’s admission “embrace alternate embodiments [as] disclosed in the [’596] patent,” including those of both recording while moving and stopping along a trajectory. *Id.* at 21; *see id.* at 21–24 (citing 3PR Nov. 2013 Comments 8–11; the ’596 patent 3:58–60, 5:52–6:23, Fig. 9; the ’490 provisional application, pp. 8–9); 3PR Resp. Br. 3–4, 7 (citing the ’596 patent 3:51–53, 4:56–58, 4:61–5:8, 7:55–64, 10:15–19, Fig. 9; the ’490 provisional application 8–9; ACP 20).

The court in *Vederi* construed the term “moving” within the phrase “image frames acquired by an image recording device moving along a trajectory” found in claim 21 of the ’025 patent. *Vederi*, 813 F. App’x at 501, 503–504. The court found “the claims to cover (1) image recording devices that acquire images while moving; (2) image recording devices that acquire images both while moving and while stationary,” but not “(3) image recording devices that acquire images only while stationary (although the image recording device moves along a trajectory at

[8] Patent Owner refers to “the ’316 patent.” PO Appeal Br. 10–11. We presume that Patent Owner intended to refer to the ’596 patent.

other times).” *Id.* at 504. Each of canceled claims 1 and 15 of the ’596 patent includes the same recitation as claim 21 of the ’025 patent addressed by the court. *Compare* the ’025 patent 17:51–53, *with* the ’596 patent 15:52–54, 17:18–20. Accordingly and as explained below, we apply a similar claim construction for the Image Frames Limitation in canceled claims 1 and 15 of the ’596 patent.

The *Vederi* court applied the “broadest reasonable interpretation” to the claims at issue, not the ordinary and customary meaning as understood by an ordinarily skilled artisan as set forth in *Phillips*. *Vederi*, 813 F. App’x at 504 (stating “[t]he broadest reasonable interpretation requires that the claim construction be reasonable in light of the specification”). Even so, the court considered the disclosure of the ’025 patent in arriving at its construction. *Id.* (citing the ’025 patent 2:27–29, 3:47–49, 3:54–57, 4:50–53, 4:55–58, 5:18–19, 5:52–54, 6:58–61, Fig. 9). Similar passages to those cited by the court in the ’025 patent are found in the Specification of the ’596 patent at issue in this appeal.

In particular, the Specification states “an image recording device moves along a path recording images of objects along the path” (the ’596 patent 2:27–29), “[m]ovement to the camera 10 is provided by a base, platform, or motor vehicle moving at an average speed of preferably about 20 miles/hour” (*id.* at 4:55–57), and “the camera 10 moves along the path” (*id.* at 5:18). *See also id.* at 4:51–53 (discussing a camera moving along a path); 5:53–54 (same), 6:59–61 (same). The *Vederi* court also states “the [S]pecification contemplates that some photos may be taken while the vehicle is stopped, for example, at an intersection.” *Vederi*, 813 F. App’x at 504 (citing the ’025 patent, Fig. 9); *see also* the ’596 patent, Fig. 9.

When read in view of the Specification of the ’596 patent, we determine that the ordinary and customary meaning of “moving” within the Image Frames

Limitation in canceled claims 1 and 15 as understood by an ordinarily skilled artisan at the time of the invention includes an image recording device that acquires images associated with image frames (1) while moving and (2) both while moving and while stationary as long as some images are associated with image frames acquired while the image recording device is moving.

Also, "Patent Owner agrees that the 'trajectory' [recited in the Image Frames Limitation of canceled claims 1 and 15] need not be preplanned." PO Appeal Br. 19; *see id.* at 18–19. The Examiner and Requester similarly agree. RAN 25; *see also* 3PR Resp. Br. 3 n.1 (noting that Patent Owner concedes the "trajectory" need not "be preplanned"[9]); 3PR Appeal Br. 17. Patent Owner also contends that "when the images are being retrieved in response to a user input, the trajectories of the image acquisition device are known." PO Appeal Br. 19. Requester contends the Image Frames Limitation does not require a known or specific trajectory. 3PR Appeal Br. 17–18; s*ee also* 3PR Resp. Br. 3 n.1.

The '596 patent describes a trajectory as synonymous with a path. The '596 patent 3:56 (describing cameras "moving along a trajectory/path."). The '596 patent further provides an "illustration of a trajectory" in Figure 9 where a camera is moved along a path (e.g., 110 including streets or blocks) making turns at intersections and circling around streets. *Id.* at 3:14–15; *see also id.* at 7:58–64, Fig. 9. Even presuming, without agreeing, that the path of streets in this example (e.g., 110 in Figure 9) may have been known prior to recording, we note that there exists a level of randomness when driving down a street, such as lane shifting,

[9] Requester indicates that the Examiner took a contrary position in the proceedings for Control Nos. 95/000,681 and 65/000,682 when construing the term "trajectory" for the claims in the '025 patent and U.S. Patent No. 7,239,760. 3PR Resp. Br. 3 n.1; *see also* 3PR Appeal Br. 17–18.

which deviates from any purported, known or specific path. Furthermore, the Figure 9 example in the Specification is described as "an illustration" of a trajectory, whereas the claim's scope is not limited to this illustration. *Compare* the '596 patent 15:54, *with id.* at 3:14–15 (stating "FIG. 9 is an illustration of a trajectory"), 7:58–64 (describing Figure 9). Thus, under its ordinary meaning and consistent with the Specification of the '596 patent, the recited "trajectory" in canceled claims 1 and 15 need not be a preplanned, specific, or known trajectory.

In sum, we find that the Image Frames Limitation ("wherein the images are associated with image frames acquired by an image recording device moving along a trajectory") in canceled claims 1 and 15 requires the image recording device moves along a path or route, which is not necessarily preplanned, specific, or known, and that the image recording device acquires images that "are associated with image frames acquired by an image recording device" (1) while moving or (2) both while moving and while stationary as long as some image frames are acquired while the image recording device is moving.

2. Composite Image of Claim 4

Claim 4 depends from claim 1 and adds "the first and second images are each a composite image, wherein each composite image is created by processing pixel data of a plurality of the image frames." The '596 patent 16:6–9. The Examiner finds the phrase, "composite image," includes synthesizing multiple images and combining four images into a single image. *See* RAN 28 (citing Lachinski 5:25–31). For support, the Examiner also refers to the Requester's Comments filed November 25, 2013. *Id.* (citing 3PR Nov. 2013 "Comments" 5–6, 17–19). In these comments, Requester argues Patent Owner improperly imported a particular embodiment found in the '596 patent's Specification into the claims.

3PR Nov. 2013 Comments 18; *see also* 3PR Resp. Br. 8 (stating that Patent Owner's construction "improperly imports limitations from Figure 2"). Requester also states a plain meaning of "composite image" does not require a single, new view and can include a four-view image. 3PR Nov. 2013 Comments 18–19; *see also* 3PR Resp. Br. 8.

Patent Owner argues the Examiner's interpretation is unreasonable. PO Appeal Br. 19–23[10]; *see also* PO Reb. Br. 7–10. Specifically, Patent Owner argues that:

> The composite image depicts a single new view of the objects in the geographical area. The single new view is different from any of the views depicted in any one of the image frames from which the composite image is created, *e.g.*, it can be a wider view. Moreover, the new view is from a single location as if the viewer [was] at that location.

PO Appeal Br. 19; *see also id.* at 20–21 (reproducing the '596 patent, Figs. 2, 16 (in part); U.S. Provisional Application No. 60/238,490, Fig. 11) (citing U.S. Provisional Application No. 60/238,490, p. 8), 23; PO Reb. Br. 7 (citing the '596 patent 1:50–54, 1:58–60). Patent Owner further contends that "[n]othing in the '596 patent suggests that two or more separate and independent images depicting separate and distinct views of different objects is a 'composite image' as used in the '596 patent simply because they are displayed simultaneously on a screen." PO Appeal Br. 23.

When considering the disclosure, the '596 patent discusses creating "composite images" by synthesizing images, image data, or image frames but does

[10] Patent Owner refers to claims 13, 18, 23, and 36 when discussing the "composite images" limitation. PO Appeal Br. 19. Notably, claims 13, 18, and 36 are not the subject of this reexamination, and claim 23 has been canceled. RAN 1.

not disclose how the images are synthesized or combined to form the composite image. The ’596 patent, code (57), 2:22–24, 2:34–36, 3:46–49, 5:45–47. The Specification also states image data from each selected image frame 42 in Figure 2 is extracted and combined to form the composite image. *Id.* at 5:66–6:1, Fig. 2.

The plain and ordinary meaning of “composite” includes “something that is made up of different parts.”[11] A single image consisting of data from four reduced image frames is something made from different parts (e.g., a composite). An ordinary meaning of (1) “synthesize”[12] includes “to make (something) by combining different things” or “to combine (things) in order to make something new,” and (2) “combine,”[13] includes “to unite into a single number or expression.” Thus, the phrase “composite image” consistent with the Specification and its ordinary meaning should be construed to mean a single image created by combining different image data or by uniting image data.

The Federal Circuit agreed with this claim construction in *Vederi,* determining the term “composite image,” such as that found in claim 4 of the ’596 patent, can reasonably be construed to include “a single image created by combining different image data or by uniting image data.” *Vederi*, 813 F. App’x at 503 (citing the ’025 patent, 5:66–6:1). The court also stated “[w]e are not persuaded by Vederi’s argument” that limits the claimed “‘composite image’ to ‘a

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[11] *Composite* (noun), Merriam-Webster’s Online Dictionary, *available at* http://www.merriam-webster.com/dictionary/composite.
[12] *Synthesize*, Merriam-Webster’s Online Dictionary, *available at* http://www.merriam-webster.com/dictionary/synthesize.
[13] *Combine*, Merriam-Webster’s Online Dictionary, *available at* http://www.merriam-webster.com/dictionary/combine (def. 1c).

new image . . . that depicts a single new view (from a single location) of the objects in the geographical area that is different from any of the views depicted in any one of the image frames from which the composite image is created.'" *Vederi*, 813 F. App'x at 503 (quoting the '025 patent, 5:66–6:1; *Personalized Media Commc'ns, LLC v. Apple Inc.*, 952 F.3d 1336, 1343 (Fed. Cir. 2020)).

Accordingly, "a composite image" in claim 4 does not require the composite image to be an image having a single view from one location, a new view, a different view, or a wider field of view than any acquired image frame as argued by Patent Owner. Stated differently, "although the specification often describes very specific embodiments of the invention, [the Federal Circuit] ha[s] repeatedly warned against confining the claims to those embodiments." *Phillips*, 415 F.3d at 1323 (citing *Nazomi Commc'ns, Inc. v. ARM Holdings, PLC*, 403 F.3d 1364, 1369 (Fed. Cir. 2005); *Liebel-Flarsheim Co. v. Medrad, Inc.*, 358 F.3d 898, 906–08 (Fed. Cir. 2004)). We thus do not confine our understanding of the phrase, "composite image" in claim 4, to the exact representations in the Specification.

Patent Owner also discusses "the patent infringement suit" between Patent Owner and Requester. PO Appeal Br. 19 n.1; *see also id.* at 20 (stating "a composite image 40 . . . has pixel values that are computed from pixel values of each of the image frames from which the composite image is created"). According to Patent Owner, the parties in that proceeding "agreed that 'a composite image created by processing pixel data of a plurality of the image frames' meant 'an image formed by combining two or more image frames at the pixel level.'" *Id.* at 19 n.1 (citing "Joint Construction of Agreed Terms, Joint Exhibit C to Plaintiff Vederi, LLC's Opening Claim Construction Brief, Exhibit D hereto").

The court in *Vederi* found the phrase "by processing pixel data of a plurality of the image frames," similar to that found in claim 4 of the '596 patent (the '596 patent 16:8–9), specifies "the image may be achieved by combining or uniting image data, meaning at the level of pixel data." *Vederi*, 813 F. App'x at 503 (citing the '025 patent, 19:6–14). But, this recitation does not recite *how* the pixel data of the images frames are processed, such that pixel values of the composite image are computed from pixel values of two or more image frames. We stress that the '596 patent states a *preference* for the composite image to be created by extracting image data from each image frame on a column-by-column basis. *See* the '596 patent, code (57), 6:1–15, Fig. 2. But, applying the ordinary meaning of "processing," claim 4 requires no more than "combining or uniting image data, meaning at the level of pixel data." *Vederi*, 813 F. App'x at 503.

Accordingly, the limitation of "a composite image" and "each composite image is created by processing pixel data of a plurality of the image frames" in claim 4 collectively means a single image created by combining different image data or uniting image data of image frames at the level of pixel data.

3. Web page for the retail establishment in claim 21

Claim 21 ultimately depends from canceled claim 15 and adds "wherein the particular one of the objects is a retail establishment, the method further comprising: accessing a web page for the retail establishment; and invoking by the computer system a display of the web page on the display screen." The '596 patent 18:7–12. Neither party disputes this claim or how this claim should be construed in this proceeding.

However, we note the court in *Vederi* stated "[t]he Board limited a 'web page for the retail establishment' to web pages belonging to, owned by, or operated

by the retail establishment." *Vederi*, 813 F. App'x at 504 (citing *Google Inc. v. Vederi, LLC*, No. 95/000,681, 2016 WL 792285, at *2–3 (PTAB Feb. 26, 2016)). The court found this characterized interpretation as "unduly narrow." *Id.* The court indicated "an online Yellow Pages directory may be a web page for a retail establishment in that it shows particular information about the retail establishment for the convenience of a consumer" (*id.* at 505) and further states "a web page, such as an online Yellow Pages directory, may be associated with a particular retail establishment, but not owned or controlled by that establishment" (*id.* (citing the '025 patent 12:53–56)).

The Specification of the '596 patent does not describe an online Yellow Pages directory but does discuss "business establishments" (the '596 patent 12:48), stating that "the establishment" can be "associated with a particular Web page" (*id.* at 12:53–54). Consistent with the Specification, an ordinary meaning of the recited "web page for the retail establishment" in claim 21 as understood by an ordinarily skilled artisan at the time invention would have included a web page in which a business or retail establishment is associated. *See id.* This web page thus may include more than those belonging to, owned by, or operated by the retail establishment. *See id.*; *see also Vederi*, 813 F. App'x at 504.

Although the court did not provide us an explicit claim construction for the phrase "web page for the retail establishment" found in claim 21, we understand the ordinary meaning of this phrase to include a web page that (1) shows particular information about the retail establishment or (2) is associated with a particular retail establishment.

B. Pending Rejections

Claim 4 is rejected under: (1) 35 U.S.C. § 102(b) based on Yee and (2) 35 U.S.C. § 102(a) based on (a) Dykes, (b) Al-Kodmany, and (c) Bates. RAN 6–13. Claim 4 is also rejected under 35 U.S.C. § 103(a) based on (3) Murphy and Yee, (4) Shiffer and Yee, and (5) Ishida and Dykes. *Id.* at 14–19. Claim 21 is rejected under 35 U.S.C. § 103(a) based on Ishida and Dykes. *Id.* at 17–19.

These rejections were presented on the claims as amended and prior to the ’596 patent’s expiry. We reverse the rejections given the particular circumstances of this proceeding, which include that the dependencies of the claims have changed since the ’596 patent’s expiry, the Federal Circuit provided intervening claim construction for claim terms in the ’025 patent, and the claims are now construed under *Phillips* as opposed to the broadest reasonable construction. *Compare Phillips*, 415 F.3d at 1312–13, *with Personalized Media Commc’ns*, 952 F.3d at 1340.

C. New Grounds of Rejection

Pursuant to 37 C.F.R. § 41.77(b), we present a new ground of rejection for: (1) claim 4 under 35 U.S.C. § 103(a) based on Yee, Dykes, and Lachinski and (2) claims 4 and 21 under 35 U.S.C. § 103(a) based on Ishida, Yee, and Dykes.

Of note, Patent Owner argues that the citation to Lachinski by Requester is improper and should be excluded from consideration because Lachinski was “introduced . . . for what Lachinski discloses in itself; it is not explaining another reference.” PO Appeal Br. 24; *see also id.* at 23–24; PO Reb. Br. 10–11. Requester contends that its reliance on and discussion of Lachinski is proper under 37 C.F.R. § 1.948(a)(2). *See* 3PR Resp. Br. 18–19 (contending Lachinski was

cited to explain Yee's teachings, including its mobile mapping system) (citing May 22, 2013 3PR Comments 27); *see also* RAN 20. But, the propriety of whether a reference was properly submitted under § 1.948 is a petitionable matter. Because this issue is not appealable, the Board lacks jurisdiction to decide this issue. *See* MPEP §§ 1002 and 1201; *see also In re Hengehold*, 440 F.2d 1395, 1403 (CCPA 1971) (stating that there are many kinds of decisions made by examiners, "which have not been and are not now appealable to the board or to this court when they are not directly connected with the merits of issues involving rejections of claims, but traditionally have been settled by petition to the Commissioner").

Nonetheless, we underscore that "should the Board have knowledge of any grounds not raised in the appeal for rejecting any pending claim, it may include in its opinion a statement to that effect with its reasons for so holding, which statement shall constitute a new ground of rejection of the claim." 37 C.F.R. § 41.77(b).

1. Claim 4

Because claim 4 depends from canceled claim 1, we adopt the findings and conclusions related to claims 1 and 4 by the Requester and the Examiner when addressing Yee. *See* Request 79–88 (citing Yee 389–92; Ex. CC-B; Ex. OTH-B 104:16–20, 121:1–3; Ex. OTH-D 17:7–9); *see also* Ex. CC-B 1–8 (citing Yee 389–92); RAN 8–9 (citing Yee 389, 391–92, Fig. 1) (incorporating Request 79–97, Ex. CC-B); 3PR Resp. Br. 11–12 (citing Yee 388–89; Lachinski 5:25–40; ACP 22); 3PR Appeal Br. 5–12 (citing Yee 389–92, Abstract; ACP 7, 22; RAN 8–9, 27–28; Lachinski 5:25–31). We highlight that Yee discusses acquiring images as the vehicle, which houses its cameras, moves down the road or the recited "the images are associated with image frames acquired by an image recording device moving

along a trajectory" (the Image Frames Limitation) as canceled claim 1 recites. Yee 388–390 (describing the van is driving on the streets and recording images in all four directions as the van travels); *see also* Request 84 (citing Yee 389–90). We also highlight Yee's "rolling video" or "single-frame images" (Yee 392) depict objects' elevations and its views in a geographic area, including curbside views, street views, real estate views, houses, street lights, guard rails, and highway striping (*id.* at 389). *See also* RAN 8–9 (noting the same). The Request also turns to Yee's discussion of various views, including "composite of them," to teach the recited "composite image" and how the image is created. Request 87–88 (quoting Yee 389) (citing Ex. CC-B); *see also* Ex. CC-B 8 (quoting Yee 389).

Patent Owner disputes that Yee teaches the recited first or second "composite image" of claim 4 when properly construed in light of the '596 patent. PO Appeal Br. 27–30; *see also* PO Reb. Br. 8–10, 12. Patent Owner refers to "Section VII.A.3" of its brief, contending that Yee fails to disclose "a composite image." PO Appeal Br. 27. In Section VII.A.3, Patent Owner argues the Examiner relies upon a changed meaning for composites in determining that Yee anticipates claim 4. *See id.* at 21–22. Patent Owner asserts that the discussion in Yee of composites includes "side-by-side views" or "multiple views, such as a 4-view display." *Id.* at 22. Patent Owner contends that each view is depicted in a separate image and cannot be a composite as recited, which requires a single view of objects. *Id.* at 22–23.

As discussed above in Section (III)(A)(2), we determine the phrase "composite image" includes a single image created by combining different image data or by uniting image data but does not have to be "a single new image with a *new view*" as urged by Patent Owner. *Id.* at 28. Moreover, as for the remaining

phrase that "each composite is created by processing pixel data of a plurality of the image frames," we found that the recitation requires only combining different image data or uniting image data of image frames at the level of pixel data (see Section (III)(A)(2)) but does not recite how the pixel data of the images frames are processed.

We determine Yee teaches or suggests the recited "composite image" recitation. Although identity of terminology is not required, Yee actually discloses "composites." That is, Yee states "[s]ome of the specific data to be collected and made available . . . include: curbside view, front and back; street view, front and back; real estate view left and right; real estate and addresss [sic] zoom, 4-view; and *composites of them*." Yee 389 (emphasis added). This portion of Yee explicitly discloses a composite image (i.e., "composite of them"). *Id.* Notably, the language "composites of them" in Yee is separate from the other described views, including the 4-view, and "them" refers back to the other discussed views, including a curbside view, a street view, and a real estate view.

To illustrate, the Examiner identifies, and we agree "a composite display of (for example) a curbside view with a front and back view is a new view manipulated at the pixel level and synthesized from multiple images." RAN 28. As another example, a composite in Yee may combine or unite image data from (1) the curbside view and the street view or (2) two different street views to produce the disclosed "composite[] of them." *See* Yee 389. Additionally, an ordinarily skilled artisan would have recognized Yee's disclosed "composites" (*see id.*) would have involved combining or uniting the views at the level of pixel data in some manner so as to form the disclosed "composites" available to the user in Yee.

We thus disagree with Patent Owner that the Examiner changes the meaning of "composite" in determining Yee teaches the recited "composite image" in claim 4.

Patent Owner argues that Yee's composites "teaches away from creating composite images with its process." PO Appeal Br. 28. This argument contrasts directly with Yee's explicit disclosure of a process that creates "composites" from collected data. Yee 389.

As for Patent Owner's assertion that Yee's discussion of composites includes "side-by-side views," "multiple views," or "a 4-view display" (PO Appeal Br. 22–23; *see also id.* at 28 (addressing Lachinski)), this argument is unavailing. As explained above, Yee discuses "composites of them" separate from its "4-view." Yee 389. This teaching at least suggests to an ordinarily skilled artisan that each of Yee's "composites of them" is a single image that may be created by combining or uniting image data from a plurality of image frames (e.g., street and curbside views) at the level of pixel data as we construed the phrase "composite image" in Section (II)(A)(2).

To the extent that Yee's "composites of them" are not considered to teach or suggest "each composite image is created by processing pixel data of a plurality of the image frames" as claim 4 recites (for which we do not agree), the rejection further relies on Dykes. Dykes teaches a known technique for creating "composites" by combining and uniting image data (e.g., stitching) to produce a panoramic image. Dykes 132–36, Fig. 2. When substituting Dykes's known technique of forming a composite (e.g., a panoramic image) for Yee's composite image forming technique, "the combination must do more than yield a predictable result." *KSR*, 550 U.S. at 416. Additionally, Dykes teaches panoramic imagery (1) can assist "with educational aims," including making more sense of maps when

looking at panoramic landscape views, or with the urban planning (Dykes 134 (quoting Shiffer 365)), (2) can evoke a visual experience in an engaging virtual environment (*id.* at 136), (3) provide an ability to navigate across the virtual space and between recognized features (*id.* at 139), and (4) permit panning around the landscape touring across the virtual environment (*id.* at 140). Thus, combining Dykes's teaching related to creating "a composite image" with Yee would have improved on Yee's system by providing educational information, evoking a visual and engaging experience, and provide the ability to navigate across a virtual space. *See KSR*, 550 U.S. at 417.

Also, Yee discloses a mobile mapping system for recording and storing images of a geographic area in a visual interface system (VIS) for an end user to locate and retrieve the collected video images. *See* Yee 391–92. Dykes discloses its process of collecting composite image data is minimal and cheap. Dykes 136, 140, 148. Thus, combining Dykes with Yee to arrive at claim 4's "composite image" would have improved on Yee's system by creating an environment that is inexpensive and easy to set up due to minimizing the collected data but still provides a spatial interface for a user to retrieve composite images (*see id.* at 134–136). *See KSR*, 550 U.S. at 417.

Patent Owner further reproduces a 4-view example in its appeal brief, asserting this is not a single view and thus not "a composite image" of claim 4. Appeal Br. 22. In concluding that this type of view is not "[a] composite image . . . created by processing pixel data of a plurality of the image frames" as claim 4 recites, Patent Owner presumes the example from "the GeoSpan Brochure"[14] (PO

[14] We are unable to locate this exhibit in the briefing. Patent Owner refers to "Exhibit E hereto." Appeal Br. 22 n.2. But, Exhibit E is an Opinion from the

Appeal Br. 22 n.2) is the only "4-view" that Yee envisions and argues "each view is depicted in a separate image" (*id.* at 22). *See id.* at 22–23, 27–28 (discussing Lachinski when arguing that Yee's "4-view" is not a composite image). Yet, the views described and shown in the GeoSpan Brochure and in Lachinksi are just examples of the data acquired and retrieved by the GeoSpan Corporation discussed in Yee. *See, e.g.*, Yee 389 (describing that data collected). In any event, Yee discusses "images can be displayed as rolling video of four views in a frame" (Yee 392), which suggests a single frame with four views or a single image created by combining different image data of image frames (e.g., from the four views) at the level of pixel data.

To the extent that Yee's "4-view" (Yee 389) is not considered "a composite image" (for which we do not agree), the rejection further relies on Lachinski. Yee discusses a "4-view" example but does not provide details concerning how the view is formed. *See id.* at 389. Lachinski, which is a patent assigned to GeoSpan Corporation (Lachinski, code (73)), explains:

> The four-view generator 62 has four inputs 82, allowing signals from four of the video cameras 50 to be input simultaneously. The generator 62 reduces the image represented by each signal to one-fourth of its original size and then *combines the reduced images to form a single video image* by placing each of the reduced images into one of the four corners of an output image.

United States District Court for the Central District of California. We did locate a submission on January 7, 2013 titled "Drive around town on your PC with GEOVISTA" (GEOVISTA) with page 2 appearing to have a similar figure to that reproduced on page 22 of Patent Owner's Appeal Brief. In any event, the Geospan brochure is not part of Patent Owner's briefing. Patent Owner also refers to its "January 2, 2013 Reply as Exhibit C" (*id.*), which is also not part of its briefing before us.

Id. at 5:25–31 (emphasis added), Fig. 3. Thus, the 4-view discussed in Yee (Yee 389) can be produced as a single image that combines four reduced images (e.g., different image data at the pixel data level), one in each of four corners that is reduced in size as taught by Lachinski's known technique.

Yee also teaches that data from the four images, which includes its pixel data, are used to create the reduced-sized images into a single image. That is, each of the "four views in a frame" discussed in Yee (Yee 392) or the "single video image" with four reduced views (e.g., one-fourth of its original size that form "reduced images" as explained in Lachinski (Lachinski 5:25–31)) is a single image that is made up of different parts or image frames (e.g., image data from multiple views) and combines pixel image data from each of the different view image frames collectively to create the single 4-view image. Yee, as evidenced by Lachinski, therefore teaches and suggests another example of "a composite image" as claim 4 recites. Moreover, combining Lachinski's known 4-view generator technique with Yee would have predictably yielded a "4-view" image (Yee 389) as a single image that combines image data from a plurality of image frames at the level of pixel data (e.g., four reduced images) or the recited "each composite image is created by processing pixel data of a plurality of the image frames" as claim 4 recites. *See KSR Int'l Co. v. Teleflex Inc.*, 550 U.S. 398, 416 (2007).

Patent Owner next contends that Yee, including its GeoSpan system, would involve "manually review[ing] the raw image frames," "select[ing] the most appropriate image" (PO Appeal Br. 28) and "add[ing] the step of creating composite images" (*id.* at 28–29), which would amount to "multiply[ing] the manual labor costs, greatly slow[ing] the process, and add[ing] another level of

complexity" (*id.* at 29). *See also id.* at 28–29.[15] The record fails to support Patent Owner's contentions, which essentially rely on arguments of counsel. *See In re Geisler*, 116 F.3d 1465, 1470 (Fed. Cir. 1997); *see also In re Pearson*, 494 F.2d 1399, 1405 (CCPA 1974) (attorney argument is not evidence). Moreover, the limitation "each composite is created by processing pixel data of a plurality of the image frames" in claim 4 does not exclude inputting some data manually, and many of the disputed features (e.g., slow, cost, precision, complexity) (PO Appeal Br. 28–29) are not commensurate in scope with claim 4. In any event, Lachinski, which addresses a GeoSpan system having similarities to Yee, discusses that a manual process is *not* used to generate composites. Lachinski 5:25–40 (discussing using generator 62 to form a single video image); *see also* 3PR Resp. Br. 12 (citing Lachinski 5:25–40; Yee 391).

Accordingly, claim 4 is newly rejected under 35 U.S.C. § 103(a) based on Yee, Dykes, and Lachinski pursuant to 37 C.F.R. § 41.77(b).

2. Claims 4 and 21—Ishida, Yee, and Dykes

Because claim 4 depends from canceled claim 1, we adopt the findings and conclusions related to claims 1 and 4 by Requester and the Examiner when addressing Ishida and Dykes. *See* Request 210–222 (citing Ishida 26–28, 34, Fig. 1; Dykes 134–36, 139–41, 144, 146, Figs. 2, 4; Ex. CC-G; Ex. OTH-B 58:18–19, 104:16–20, 106; Ex. OTH-D 17:7–9); *see also* RAN 17–19 (discussing and citing Ishida 26, Fig. 3; Dykes 142, 146–47; Request 211–12) (incorporating the Request for claims 4 and 21; Claim Chart CC-G); 3PR Resp. Br. 17–18 (citing Request 210–12; Ishida 27, Abstract; Dykes 142, 146; ACP 15–16). Because claim 21

[15] Patent Owner footnotes a reference entitled "GEN-2 City Tour BBC & CNBC 1995, January 1, 2004" and states the reference was submitted January 7, 2013. PO Appeal Br. 28 n.3. This evidence is not in Patent Owner's briefing.

ultimately depends from canceled claim 15, we adopt the findings and conclusions related to claims 15, 20, and 21 by Requester and Examiner when addressing Ishida and Dykes. *See* Request 222–236 (citing Ishida 25–27, 30–31, 34, Figs. 1, 3; Dykes 136, 139–41, 144–46, Figs. 4, 6; Ex. CC-G; Ex. OTH-B 59:18–19, 61:23–25, 104:16–20, 106, 121:1–3; Ex. OTH-D 17:7–9); *see also* RAN 17–19 (discussing and citing Ishida 26, Fig. 3; Dykes 142, 146–47; Request 211–12) (incorporating the Request for claims 4 and 21; Claim Chart CC-G); 3PR Resp. Br. 17–18 (citing Request 210–12; Ishida 27, Abstract; Dykes 142, 146; ACP 15–16).

Concerning claim 21, we repeat that the phrase "web page for the retail establishment" includes a web page (1) that shows particular information about the retail establishment or (2) associated with a particular retail establishment as discussed in Section (III)(A)(3). *See Vederi*, 813 F. App'x at 505. Ishida teaches a social information infrastructure for a city (e.g., Kyoto) that includes shopping, business, transportation, education, and other information. *See* Ishida 23–24, Abstract. This infrastructure integrates both World Wide Web archives and real-time information related to the city into WEB and ftp interface (e.g., the interface or second layer) on the Internet. *See id*. at 23–25, 28. Specifically, Ishida's Section 4 indicates the digital city integrates WEB and sensory data on a map, which involves registering WEB pages with the digital city, determining the XY coordinate of each WEB page, and retrieving WEB pages. Ishida 28–30. As an example, sensors in Kyoto gather traffic data from buses that send location and route data to the live digital city, and WEB pages for bus stops are retrieved and displayed so that real-time bus data is displayed on the map of Kyoto. *See* Ishida 29–30, Fig. 5(b). As such, each of these web pages in Ishida (e.g., WEB and ftp

interface) shows particular information (e.g., bus data) about or associated with a retail establishment (e.g., a transportation company having a bus stop).

Ishida therefore teaches or suggests "the particular one of the objects is a retail establishment" (e.g., a bus stop in geographic area,[16] like Kyoto), "accessing a web page for the retail establishment" (e.g., Kyoto's or the digital city's WEB/ftp interface that contains web page information for the transportation company's bus stop) and "invoking by the computer system a display of the web page on the display screen" (e.g., displaying the Kyoto bus stop's real-time information using the WEB/ftp interface) as claim 21 recites. To the extent that a transportation company's bus stop is not viewed as "a retail establishment," Ishida also teaches its interface retrieves data related to parking, shopping, and sightseeing (*id.* at 24), which include information concerning parking lots (e.g., the nearest parking lot), restaurant tables (e.g., whether one can reserve a table at a restaurant), and shopping (e.g., what is on sale at a department store). *See id.* at 24, 30. Although Ishida further notes that information related to parking lots and restaurants are expected in the future (*id.* at 30), these teachings in Ishida at a minimum suggest "a web page for the retail establishment" recitations in claim 28 as construed in Section III(A)(3).

Turning to the arguments, Patent Owner contends that neither Ishida nor Dykes acquires image frames by "an image recording device moving along a trajectory." PO Appeal Br. 40–41, 43; *see* PO Reb. Br. 14. Patent Owner asserts that Dykes's discussion of students taking images as they travel from one location

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[16] Claim 21, from which claim 28 depends, recites "a plurality of images depicting views of objects in the geographic area." The '025 patent, 17:48–49.

to another, but that the camera is placed on a tripod and kept stationary. PO Appeal Br. 25–26 (citing Dykes 134, 141, Fig. 4); PO Reb. Br. 11.

In Section (III)(A)(1), we determined the Image Frames Limitation requires the image recording device moves along a path, course or route and that the image recording device acquires images (1) while moving or (2) both while moving and while stationary. Ishida teaches its digital city (e.g., Kyoto) interface can be built from 3D Web technology that integrates photos mapped onto 3D blocks and 2D planes to create a realistic 3DML (three-dimensional modeling language) space. Ishida 26–27, *cited in* Request 214. However, Ishida is silent regarding how its photos or image frames are obtained. Dykes provides a little more detail about how its images are obtained. Dykes 146, *cited in* Request 216–17. Dykes teaches students record images using a digital camera and obtain images at select locations along a footpath's slope. *Id.*; *see id.* at 127 (discussing data collection devices), 134 (discussing digital cameras capturing images). Although Patent Owner's assertion that Dykes "appears" to use a tripod and its camera is "stationary" (*see* PO Appeal Br. 25 (citing Dykes 134)) is not found in Dykes, Dykes is silent regarding whether the camera moves while acquiring images. *See id.* Thus, to the extent the Request relies on Dykes to teach the Image Frames Limitation (*see* Request 216–17), we determine the record does not demonstrate whether Dykes teaches these images can be obtained by an image recording device (e.g., the digital cameras) (1) while moving or (2) both while moving and while stationary.

But, as explained above in Section (III)(C)(1), Yee teaches a known technique for obtaining image frames using cameras located on a van that travels along roads (Yee 388–390 (describing the van is driving on the streets and recording images in all four directions as the van travels)) in order to "see

everything" and to "ensure[] no object is lost behind an obstruction" (*see id.* at 390). Given Ishida's desire both to obtain images of city realistically and to diminish modeling problems by using photos (*see* Ishida 26–27 (discussing "us[ing] photos mapped onto 3D blocks and 2D planes" that "significantly diminishes some of [the noted problems]")), Yee provides a solution that collects photos (e.g., images) completely and accurately for Ishida's digital city interface. Yee further discusses its system has accurate GPS three-dimensional positioning to ensure accuracy and completeness of the data collected and where the user is located. Yee 390. This teaching in Yee further assists Ishida's process of determining coordinates for images associated with WEB pages that are part of Ishida's digital city interface. *See* Ishida 29. As such, Yee, when combined with Ishida, teaches or suggests the recited "an image recording device moving along a trajectory" in canceled claims 1 and 15 so as to obtain a complete and accurate digital interface for captured environment.

Patent Owner also argues that neither Ishida nor Dykes discloses "determining a second location based on the user selected position," as recited in canceled claim 1 (and similarly recited in canceled claim 15) and refers to "Section VII.C.1.b)." PO Appeal Br. 41. In Section VII.C.1.b) (*id.* at 26–27), Patent Owner specifically argues that Dykes fails to teach another recitation of "receiving a user selection of a position on the displayed map" in canceled claim 1 because the selection is based on a hot-linked symbol within the panorama and not "on the displayed map," as recited. *Id.* at 26. Patent Owner further asserts that the selecting of icons displayed on an overhead image discussed in Dykes is a two-step process that fails to teach the three-step process in claim 1 that includes the above disputed "determining" step. *Id.* at 26–27 (citing Dykes 142).

We are not persuaded. The rejection proposes that Dykes, in combination with Ishida, teaches the "receiving a user selection of a position on the displayed map" in canceled claim 1. For example, Figure 4 of Dykes shows a map of Haytor Down on the left (e.g., VFC panoraMap) and linked panoramas on the right (VCF panoraMap:htd-018 and VCF panoraMap:mark58). Dykes 141. Dykes teaches a user clicks on *multiple* symbols on this map to specify multiple locations (e.g., first and second locations) and obtain multiple views associated with locations. *Id.* at 140–141, Fig. 4, *cited in* Request 218–219. These symbols on the panoraMap identify different locations of the panoramas. *Id.* at 140–141. Each selection on the map by a user thus constitutes "receiving a user selection of a position on the displayed map" as canceled claims 1 and 15 recite.

When the symbols on a map are clicked in Dykes, a viewer is revealed (e.g., VCF panoraMap:htd-018 and VCF panoraMap:mark58 on the middle-right and lower-right respectively) and more symbols within the viewer (e.g., down arrows) provide links to other panoramic images. *See id.*, Fig. 4; *see also* 3PR Resp. Br. 11 (discussing "user clicking on a symbol on the map"). The viewer (right in Figure 4) is separate and distinct from the panoraMap in Dykes (left in Figure 4) (Dykes 141, Fig. 4), which as explained above, permits multiple selections within the displayed panorama. Dykes further discusses the "[s]ymbols on the map identify the locations of panoramas, and reveal the view and angle of view when clicked." Dykes 139–40. Dykes discusses providing dynamic links between the map and images and that "the direction of imagery is known instantly." Dykes 140. Based on these teachings, Dykes suggests to an ordinarily skilled artisan that its process includes determining the location or position on the panoraMap associated with the selected symbol in order to reveal the proper panorama. *See id.* at 139–41. Thus,

when the user selects a position on panoraMap, Dykes at least suggests a location is determined based on the position in order to retrieve the panorama (e.g., "determining a second location based on the user selected position" in canceled claim 1 and similarly recited in claim 15).

Yee additionally teaches a visual interface feature that permits a user to point at specific locations within a city's map and provides images of the selected location in an efficient manner. Yee 388, 391–92. As such, Yee, when combined with Ishida and Dykes, further teaches or suggests the concept of "receiving a user selection of a position on the displayed map," "determining a second location based on the user selected position," and "retrieving from the image source a second image associated with the second location" as canceled claim 1 recites.

As for the contention related to a two-step process in Dykes versus the three-step process of the claims, we are not persuaded. We are not sure what three steps Patent Owner refers to, as steps (1) and (3) of the three step process are described the same. PO Appeal Br. 27 (describing both steps (1) and (3) as "retrieving from the image source a second image associated with the second location.") Also, as explained above, we further disagree that Dykes does not teach "determining a second location based on the user selected position" step in canceled claim 1 and similarly recited in canceled claim 15.

Patent Owner further contends that the Examiner has not presented a reason to combine Ishida and Dykes and that Dykes teaches away from a combination with Ishida. PO Appeal Br. 42–43. Patent Owner argues Ishida concerns a two-dimensional (2D) map with a three-dimensional (3D) model of city that a user can navigate. *Id.* at 42 (citing Ishida 24). In Patent Owner's view, Dykes concerns a method of storing and displaying multimedia data in association with specific

locations on map, which is distinct and incompatible with Ishida. *Id*. (citing Dykes 131; Ishida 27). Patent Owner further contends "that the systems disclosed in Ishida and Dykes used distinct and incompatible methods of visualizing an area" (*id.*) and "it is unclear how a person of ordinary skill in the art at the time [of] the invention was made would have combined the 3D virtual environment of Ishida with the student media database at specific locations (including panoramas) of Dykes" (*id.* at 42–43).

We are not persuaded. As noted in *In re Keller*, 642 F.2d 413 (CCPA 1981):

> The test for obviousness is not whether the features of a secondary reference may be bodily incorporated into the structure of the primary reference; nor is it that the claimed invention must be expressly suggested in any one or all of the references. Rather, the test is what the combined teachings of the references would have suggested to those of ordinary skill in the art.

Keller, 642 F.2d at 425. Thus, there is no requirement in an obviousness rejection to show how to incorporate Dykes's image database within Ishida's 3D environment. *See* 3PR Resp. Br. 18 (citing *In re Mouttet*, 686 F.3d 1322, 1332 (Fed. Cir. 2012)).

Additionally, Ishida teaches using 2D photographs to add texture and detail to buildings in its 3D model. Ishida 27, *cited in* PO Appeal Br. 42. For example, Ishida discusses a 3D interface that uses photos mapped onto 3D blocks and 2D planes to build the Shijo Shopping Street 3DML (3D Modeling Language) implementation. Ishida 27–28, Fig. 3. Based on the foregoing, Ishida obtains photographs of a region that are used to create its 3D interface. *See id.* Dykes teaches one such known technique for acquiring images of a region along a trajectory that can be integrated with other data. Dykes 146. Similarly, as explained above, Yee teaches yet another known image acquisition technique

involving an image recording device that moves along a path or trajectory. Yee 388–90. As such, one skilled in the art would have recognized integrating Dykes's and Yee's images with Ishida's interface—not necessarily using Dykes's database or how Dykes visualizes an area as argued (*see* PO Appeal Br. 42–43)—is an effective method for building Ishida's 3D blocks and that using these techniques with Ishida's 3D interface would have yielded the predictable result of integrating captured images with Ishida's system in an efficient manner. *See* RAN 18; *see also* 3PR Resp. Br. 18.

Furthermore, as explained above, Dykes is relied upon to teach and suggest techniques for retrieving user inputs that specify a first and second location, determining the location based on the selection, and retrieving the images from an image source associated with the locations as canceled claims 1 and 15 recite. *See also* Request 218–220. Thus, an ordinarily skilled artisan would have recognized several additional reasons to combine Dykes's teachings with Ishida, including to "ensur[e] that [the system's] data are stored spatially with a minimum of effort" (Dykes 142; *see also* 3PR Resp. Br. 18 (citing ACP 16 (further citing Dykes 142))) and to provide: (1) "[v]isualization [that] is a particularly suitable technique to help. . . synthesise information and understand the spatial character of collected data" (Dykes 140), (2) links between the map and images that create (a) "a powerful technique and means that the direction of imagery is known" and (b) "realistic pictures [that] can be synthesised with" the map (*id.* at 140), and (3) "an additional reality check" for the images (*id.* at 143). Dykes further discusses the images are "geo-referenced" (*id.* at 139), "geo-referenc[ing] collected data files" (*id.* at 140), and "stor[ing] geo-referenced panoramas" (*id.* at 144). *See also* RAN 18 (citing Dykes 142) (discussing "geo-referencing system of Dykes . . . help[s]

build the 3D models in Ishida."). These teachings in Dykes, along with Yee's discussed above, further assist Ishida's process of determining coordinates for images associated with WEB pages that are part of Ishida's digital city interface. *See* Ishida 29.

The Request provides yet another reason to combine the teachings of Dykes with Ishida in order to "provide[s] a system for creating a navigable digital city . . . by providing navigation images." Request 212; *see also* 3PR Resp. Br. 18 (stating "a POSITA would be motivated to use the efficient photograph collection and geo-referencing system of Dykes to help build the 3D models in Ishida."). We find each of the above-provided reasons has a rational underpinning to support an obviousness rejection. *See KSR*, 550 U.S. at 418. We, thus, disagree that Ishida and Dykes are incompatible.

Patent Owner also fails to demonstrate sufficiently that one skilled in the art would not have recognized how to use the panoramic images taught by Dykes within Ishida. *See* PO Appeal Br. 43. Such panoramic images would further augment Ishida's 3D interface by providing a greater angle of view of a block, such as the Shijo Shopping Street, to the user. *See* Dykes 127, 132, 134, 139–41; *see* Ishida 27–28. Accordingly, the record provides numerous reasons to combine Dykes and Yee with Ishida.

Lastly, Patent Owner contends that "Ishida appears to discourage the use of images" because problems exists when downloading GIF (Graphics Interchange Format) or JPEG (Joint Photographic Experts Group) compressed photos. PO Appeal Br. 43 (citing Ishida 27). However, this purported problem is described as existing with "any site on the WEB using many graphics." Ishida 27. Also, neither Ishida nor Dykes requires compressed GIF or JPEG formats. Yet, even

presuming without agreeing Patent Owner is correct that problems will exist, this problem may render the combined system somewhat inferior if GIF or JPEG images are used but does not teach away from the Ishida/Dykes combination. *See In re Gurley*, 27 F.3d 551, 553 (Fed. Cir. 2008) (indicating a known product "does not become patentable simply because it has been described as somewhat inferior to some other product for the same use.").

For the above reasons, we newly reject claims 4 and 21 based on Ishida, Yee, and Dykes.

D. Requester's Cross Appeal

Requester appeals the Examiner's decision not to adopt a proposed rejection of now improper claims (i.e., claims 72 and 73) based on Yee. 3PR Appeal Br. 2, 12–16. Because the claims appealed are improper at present, Requester's cross-appeal has been rendered moot.

IV. CONCLUSIONS

Concerning the claims rejected by the Examiner, we determine:

Claims Rejected	35 U.S.C. §	Reference(s)/ Basis	Affirmed	Reversed	New Ground
4	102(a)	Dykes		4	
4	102(b)	Yee		4	
4	102(a)	Al-Kodmany		4	
4	102(a)	Bates		4	
4	103(a)	Murphy, Yee		4	
4	103(a)	Shiffer, Yee		4	
4, 21	103(a)	Ishida, Dykes		4, 21	
4	103(a)	Yee, Dykes, Lachinksi			4

Claims Rejected	35 U.S.C. §	Reference(s)/ Basis	Affirmed	Reversed	New Ground
4, 21	103(a)	Ishida, Yee, Dykes			4, 21
Overall Outcome				4, 21	4, 21

V. TIME PERIOD FOR RESPONSE

This decision contains a new ground of rejection pursuant to 37 C.F.R. § 41.77(b). Section 41.77(b) provides "a new ground of rejection pursuant to this paragraph shall not be considered final for judicial review."

Section 41.77(b) also provides that Patent Owner, within one month from the date of the decision, must exercise one of the following two options with respect to the new grounds of rejection to avoid termination of the appeal proceeding as to the rejected claims:

> (1) *Reopen prosecution.* The owner may file a response requesting reopening of prosecution before the examiner. Such a response must be either an amendment of the claims so rejected or new evidence relating to the claims so rejected, or both.
>
> (2) *Request rehearing.* The owner may request that the proceeding be reheard under § 41.79 by the Board upon the same record. The request for rehearing must address any new ground of rejection and state with particularity the points believed to have been misapprehended or overlooked in entering the new ground of rejection and also state all other grounds upon which rehearing is sought.

In accordance with 37 C.F.R. § 41.79(a)(1), the "[p]arties to the appeal may file a request for rehearing of the decision within one month of the date of: . . .

[t]he original decision of the Board under § 41.77(a)." A request for rehearing must be in compliance with 37 C.F.R. § 41.79(b). Comments in opposition to the request and additional requests for rehearing must be in accordance with 37 C.F.R. § 41.79(c)-(d), respectively. Under 37 C.F.R. § 41.79(e), the times for requesting rehearing under paragraph (a) of this section, for requesting further rehearing under paragraph (c) of this section, and for submitting comments under paragraph (b) of this section may not be extended.

An appeal to the United States Court of Appeals for the Federal Circuit under 35 U.S.C. §§ 141-144 and 315 and 37 C.F.R. § 1.983 for an *inter partes* reexamination proceeding "commenced" on or after November 2, 2002 may not be taken "until all parties' rights to request rehearing have been exhausted, at which time the decision of the Board is final and appealable by any party to the appeal to the Board." 37 C.F.R. § 41.81. *See also* MPEP § 2682.

No time period for taking any subsequent action in connection with this appeal may be extended under 37 C.F.R. § 1.136(a)(1)(iv).

Requests for extensions of time in this proceeding are governed by 37 C.F.R. §§ 1.956 and 41.79(e).

In the event neither party files a request for rehearing within the time provided in 37 C.F.R. § 41.79, and this decision becomes final and appealable under 37 C.F.R. § 41.81, a party seeking judicial review must timely serve notice on the Director of the United States Patent and Trademark Office. *See* 37 C.F.R. §§ 90.1 and 1.983.

REVERSED
37 C.F.R. § 41.77

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Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

PTOL-90A (Rev. 04/07)

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

GOOGLE INC.
Requester,

v.

Patent of VEDERI, LLC.
Patent Owner.

Appeal 2015-001495
Reexamination Control 95/000,681
Patent 7,805,025 B2
Technology Center 3900

Before JOHN A. JEFFERY, DENISE M. POTHIER, and ERIC B. CHEN, *Administrative Patent Judges*.

POTHIER, *Administrative Patent Judge*.

DECISION ON REQUEST FOR REHEARING

STATEMENT OF THE CASE

This proceedings involve U.S. Patent No. 7,805,025 B2 ("the '025 patent), which expired on January 11, 2021. Dec. 2.[1] This proceeding is

[1] Throughout this Opinion, we refer to: (1) the Request for *Inter Partes* Reexamination ("Request") filed August 20, 2012, (2) the Right of Appeal

also related to Reexamination Control Nos. 95/000,682–95/000,684, involving U.S. Patent Nos. 7,239,760 B2, 7,577,316 B2, and 7,813,596 B2 respectively, all of which have also expired.

As previously explained (*see* Dec. 2), this proceeding returns to the Board on remand from the Court of Appeals for the Federal Circuit, which vacated previous Board decisions for this proceeding mailed June 26, 2015, February 29, 2016, and March 1, 2016. *Vederi, LLC v. Google LLC*, 813 F. App'x 499, 501, 505 (Fed. Cir. 2020). On remand, another panel[2] rendered a Decision on Appeal (" the June 2021 Decision") on June 1, 2021, (1) reversing (a) the rejection of claims 2–6, 8–10, 14–18, 20, 33–36, 56–60, 64–68, and 70–72 based on Yee and Dykes under 35 U.S.C. § 103(a), and (b) the confirmation of claims 24, 26, 28, 29, 37, 38, 41, 42, 44–48, 51–54, and 63; and (2) entering new grounds of rejection under 37 C.F.R. § 41.77(b) for (a) claims 2–6, 8–10, 14–18, 20, 24, 26, 28, 33–38, 41, 42,

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Notice ("RAN") mailed September 24, 2013, (3) the Patent Owner's Appeal Brief ("PO Appeal Br.") filed December 24, 2013, (4) the Requester's Respondent Brief ("3PR Resp. Br.") filed January 24, 2014, (5) the Requester's Appeal Brief ("3PR Appeal Br.") filed January 24, 2014, (6) the Examiner's Answer ("Ans.") mailed July 9, 2014, (7) Requester's Request for Rehearing Under 37 CFR § 41.79 ("3PR July 2015 Reh'g Request") filed July 27, 2015, (9) the Board's Decision mailed June 1, 2021 ("Dec."), (10) Patent Owner's Request for Rehearing ("Req. Reh'g") filed July 1, 2021, and (11) Requester's Comments in Opposition to Patent Owner's Request for Rehearing ("3PR Comments") filed August 2, 2021.

[2] The panel included Judges Pothier, Chen, and Branch.

44–48, 51–54, 56–60, 63–68, and 70–72 based on Yee[3] and Dykes[4] under 35 U.S.C. § 103(a), and (b) claims 28, 29, 51, and 63 based on Ishida,[5] Dykes, and Yee under 35 U.S.C. § 103(a). Dec. 4, 58–59, 61.

In response to the new grounds, Patent Owner requested rehearing under 37 C.F.R. § 41.79 ("Request for Rehearing") on July 1, 2021. Requester responded with comments pursuant to 37 C.F.R. § 41.79(c) ("3PR Comments") on August 2, 2021.

We have reconsidered the June 2021 Decision in light of Patent Owner's contentions in the Request for Rehearing. Patent Owner sets forth reasons why the earlier panel allegedly misapprehended or overlooked points in entering the new grounds of rejection. As discussed below, we maintain the determinations made in the June 2021 Decision.

DISCUSSION

"The request for rehearing must address any new ground of rejection and state with particularity the points believed to have been misapprehended or overlooked in entering the new ground of rejection and also state all other grounds upon which rehearing is sought." 37 C.F.R. § 41.77(b)(2) (2020); *see also* 37 C.F.R. § 41.79(b)(1) (2020).

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[3] Frank Yee, *GPS & Video Data Collection In Los Angeles County: A Status Report, Position Location And Navigation Symposium,* Proc. IEEE Position Location and Navigation 388–93 (1994) ("Yee").
[4] J. Dykes, *An Approach To Virtual Environments For Visualization Using Linked Geo-referenced Panoramic Imagery,* 24 Computers, Env't & Urb. Sys. 127–52 (2000) ("Dykes").
[5] Toru Ishida et al., *Digital City Kyoto: Towards A Social Information Infrastructure,* 1652 Lecture Notes in Artificial Int. from Int'l Workshop on Cooperative Inf. Agents 23–35 (1999) ("Ishida").

Patent Owner argues that the June 2021 Decision does not construe several terms in the claims of the ’025 patent under their ordinary and customary meanings. Req. Reh’g 2. These terms include “a composite image” in claims 6, 18, 34, 35, and 68 or “each composite image” in claim 35 (*id.* at 2–8), “accessing a web page for the retail establishment; and invoking by the computer system a display of the web page on the display screen” (“the Web Page Limitations”) in claim 28 (*id.* at 8–9, 28), and “a second user input specifying a navigation direction relative to the first location” and “determining a second location based on the user specified navigation direction” in canceled independent claim 1 and similarly found in canceled independent claims 13, 21, 43, and 55[6] (*id.* at 9–12).

Patent Owner also asserts that: (1) Yee and Dykes do not teach “a second user input specifying a navigation direction relative to the first location” and determining “a second location based on the user specified navigation direction” found in claim 21 and similarly found in dependent claim 33 (Req. Reh’g 13–18), (2) the Decision does not articulate how Dykes modifies Yee to arrive at the claimed combination (*id.* at 18–21), and (3) Yee alone or Yee and Dykes in combination do not disclose a “composite image” in claims 6, 18, 34, 35, and 68 (*id.* at 21–26). Regarding the combination of Ishida, Dykes, and Yee, Patent Owner further argues: (1) Ishida does not teach the Web Page Limitations in claim 28 because Ishida does not disclose displaying information as a web page (*id.* at 27–30), and

[6] As previously explained, independent claims 1, 13, 21, 43, and 55 have been canceled. Dec. 3. However, each pending claim ultimately depends from one of claims 1, 13, 21, 43, and 55 and thus includes the limitations found in one of these claims. *See* the ’025 patent, 15:42–22:62.

(2) the Decision does not clearly articulate how the teachings of Ishida, Dykes, and Yee would be combined to arrive at claims 29, 51, and 63 (*id.* at 30–33).

Requester disagrees. *See generally* 3PR Comments 1–18. We address each of Patent Owner's contentions below.

ANALYSIS

I. *Claim construction*

A. *"[C]omposite image" in claims 6, 18, 34, 35, and 68*

The phrase "composite image" is found in claims 6, 18, 34, 35, and 68. The '025 patent 16:16, 17:31, 19:7, 19:12, 22:28. In the June 2021 Decision, an earlier panel found this phrase means "a single image created by combining different image data or by uniting image data." Dec. 20.

Patent Owner asserts that the phrase "composite image" consistent with the Specification,

> means a new image, created by processing pixel data of a plurality of image frames, that depicts a single new view (from a single location) of the objects in the geographical area that is different from any of the views depicted in any one of the image frames from which the composite image is created.

Req. Reh'g 7; *see id.* at 3–8 (quoting the '025 patent, Abstract, 1:27–57, 2:10–12, 2:33–39, 3:46–49, 5:45–51) (citing the '025 patent 2:37–39, 5:45–6:5, 9:10–21) (reproducing the '025 patent, Fig. 16; Provisional Application No. 60/238,490, Fig. 11). Patent Owner also appears to argue that "composite image" under *Phillips* "refers to a single image created by combining different image data or by uniting image data [wh]ere the single

image provides a single view." *Id.* at 8.

Requester asserts Patent Owner's arguments were previously raised and rejected by the Board and the Federal Circuit. *See* 3PR Comments 2–4 (citing *Vederi,* 813 F. App'x at 503; Dec. 17; the '025 patent 5:66–6:1). Additionally, Requester asserts Patent Owner is attempting to limit the phrase "composite image" "to cover only narrow preferred embodiments in the specification." *Id.* at 4 (citing Dec. 18).

The Board gave the claim recitations in the '025 patent "'their ordinary and customary meaning' as would have been understood by 'a person of ordinary skill in the art in question at the time of the invention.'" Dec. 9–10 (quoting *Phillips v. AWH Corp.,* 415 F.3d 1303, 1312-13 (Fed. Cir. 2005)); *see id.* at 17 nn.12–14 (addressing the term "composite") (citing Merriam-Webster's Online Dictionary (11th ed.)). Additionally, the Board stated "[c]laims 'must be read in view of the specification, of which they are a part'" and that "the specification 'is always highly relevant to the claim construction analysis.'" *Id.* at 10 (quoting *Phillips,* 415 F.3d at 1315 (citation omitted)). Consistent with these principles, the Board has considered how the Specification of the '025 patent describes a "composite image" in arriving at the current claim construction. *See id.* at 16–17 (citing the '025 patent, Abstract, 2:22–24, 2:34–36, 3:46–49, 5:45–47, 5:66–6:15).

The Board further considered and gave appropriate weight to the Federal Circuit's construction of the phrase "composite image," which agreed with the Board's claim construction of "a composite image." *Id.* at 17 (quoting *Vederi,* 813 F. App'x at 503). Notably, the Federal Circuit rejected Vederi's proffered

> narrowing construction that would limit 'composite image' to 'a new image, created by processing pixel data of a plurality of image frames, that depicts a single new view (from a single location) of the objects in the geographical area that is different from any of the views depicted in any one of the image frames from which the composite image is created.

Vederi, 813 F. App'x at 503; *see also* Dec. 17–18 (quoting *Vederi*, 813 F. App'x at 503).

We thus disagree that the Board overlooked or misapprehended an argument that the phrase a "composite image" in claims 6, 18, 34, 35, and 68 was construed inconsistent with the '025 patent or its plain and ordinary meaning as an ordinarily skilled artisan would have been understood.

B. *"[A] web page for the retail establishment" in claim 28*

Claim 28 ultimately depends from claim 21 and recites, in pertinent part, "accessing a web page for the retail establishment; and invoking by the computer system a display of the web page on the display screen" (the Web Page Limitations). The '025 patent, 18:46–49. Regarding the recitation "web page for retail establishment," the June 2021 Decision states "we understand the ordinary meaning of this phrase to include a web page that (1) shows particular information about the retail establishment or (2) is associated with a particular retail establishment." Dec. 22.

Patent Owner contends that the June 2021 "Decision does not appear to provide a construction for the term 'web page' in accordance with the ordinary meaning of the phrase." Req. Reh'g 8. Patent Owner

> submits that a person of ordinary skill in the art at the time of the invention would understand that a Web page is a hypertext document written in the Hypertext Markup Language (HTML), which may further include images, video, and/or client-side

> scripts (e.g., VBScript or JavaScript)[], and a Web browser renders a Web page to be displayed to a user.

Id. at 9 (citing the ’025 patent 12:53–56, Fig. 16) (omitting footnote); *see id.* n.1 (citing *Web page*, The American Heritage® Dictionary of the English Language (defining “n. A document on the World Wide Web, consisting of a hypertext file and any related files for scripts and graphics, and often hyperlinked to other documents on the Web.”)).

Requester contends that the Federal Circuit found “for this exact term[,] that the ‘[t]he [sic] specification does nothing to limit [the] broad claim language’ at issue.” 3PR Comments 8 (quoting *Vederi*, 813 Fed. App’x at 504[7]) (last bracketing in original). Requester asserts that Patent Owner does not “heed[] the Federal Circuit’s caution” and instead attempts to narrow the claim construction of the “web page” to include “a ‘web browser’ limitation,” which is not supported by the dictionary definition presented by Patent Owner and is only described as a preferred feature in the ’025 patent’s Specification. *Id.* at 8–9 (citing Req. Reh’g 9 n.1; *Web page*, The American Heritage® Dictionary of the English Language; the ’025 patent 12:53–56).

Although we did not construe the phrase “web page” explicitly in the Decision, we did address what “a web page for retail establishment” would encompass— “a web page that (1) shows particular information about the retail establishment or (2) is associated with a particular retail establishment.” Dec. 22. In reaching this determination, we considered the passage from the ’025 patent cited by Patent Owner. *See id.* at 21

[7] The quotation is found at *Vederi*, 813 Fed. App’x at 505.

(discussing the ’025 patent 12:48, 12:53–54). Furthermore, as the Federal Circuit found, “[t]he specification does nothing to limit this broad claim language” of “accessing a web page for the retail establishment” as claim 28 recites. *Vederi*, 813 Fed. App’x at 505. As such, contrary to Patent Owner’s assertions (*see* Req. Reh’g 9), the Specification does not define or limit the phrase “web page” found in claim 28 to include a web browser for rendering and displaying the web page. Indeed, the definition of “web page” provided by Patent Owner—“[a] document on the World Wide Web, consisting of a hypertext file and any related files for scripts and graphics, and often hyperlinked to other documents on the Web” (*Web page*, The American Heritage® Dictionary of the English Language, *available at* https://www.ahdictionary.com/word/search.html?q=web+page)—does not require a rendered web page to be displayed using a web browser.

Additionally, although the Specification’s column 12 describes an embodiment that “preferably” displays a web page “on a separate browser window” (the ’025 patent 12:55–56), we decline to import this specific embodiment into claim 28, which only recites “invoking . . . a display of the web page on the display screen” without limiting the invocation to using a web browser. *Id.* at 18:47–48; *see also Phillips*, 415 F.3d at 1323 (“[A]lthough the specification often describes very specific embodiments of the invention, [the Federal Circuit] ha[s] repeatedly warned against confining the claims to those embodiments.”), *quoted in* Dec. 18.

That said, the Patent Owner has provided a definition of “a web page,” which is “[a] document on the World Wide Web, consisting of a hypertext file and any related files for scripts and graphics . . . .” *Web page*,

The American Heritage® Dictionary of the English Language, *cited in* Req. Reh'g 9. Other than disputing the "unduly narrow construction requiring a 'web browser'[,]" Requester has not challenged this meaning of "web page" on the record. *See* 3PR Comments 8–9. We find this definition is one plain meaning of the phrase "web page." The remainder of the "web page" definition, however, states the document is "*often* hyperlinked to other documents on the Web" (*Web page*, The American Heritage® Dictionary of the English Language (emphasis added)), and thus, this hyperlinked feature is not required to be "web page" as claim 28 recites.

We thus disagree that the Board overlooked or misapprehended an argument that the phrase "a web page for a retail establishment" in claim 28 was construed inconsistent with the '025 patent or its plain and ordinary meaning as an ordinarily skilled artisan would have been understood. We further determine "a web page" includes a document on the World Wide Web, consisting of a hypertext file and any related files for scripts and graphics.

C. *"[A] second user input specifying a navigation direction relative to the first location in the geographic area" and "determining a second location based on the user specified navigation direction" in claim 1 and similarly found in claims 13, 21, 43, and 55*

Canceled independent claim 1 recites "receiving a second user input specifying a navigation direction relative to the first location in the geographic area" and "determining a second location based on the user specified navigation direction" ("the Navigational Direction Limitations"). The '025 patent 15:57–61. Canceled independent claim 21 recites

"receiving . . . a second user input specifying a navigation direction relative to the first location" and "determining . . . a second location based on the user specified navigation direction." The '025 patent 17:65–18:2. Canceled independent claims 13, 43, and 55 recites similar limitations. *Id.* at 17:1–5, 19:65–20:2, 21:18–22. In the June 2021 Decision, the panel did not provide a claim construction for these recitations.

Patent Owner asserts an ordinarily skilled artisan would have understood that the Navigational Direction Limitations recite "a two-step process" "in which a system receives a user input specifying a direction relative to a first location (e.g., the user input specifies a direction east of the first location) and then determines a new, second location based on the specified direction (e.g., eight meters east of the first location)." Req. Reh'g 12; *see id.* at 11–12 (quoting the '025 patent 13:10–20) (reproducing the '025 patent, Fig. 16). Requester states that "Patent Owner's proffered construction mostly repeats the language of the claim" and further "disagrees that Patent Owner's construction is proper, to the extent it is limited by the purported examples — 'a direction east of the first location' and 'eight meters east of the first location.'" 3PR Comments 14 (citing Req. Reh'g 12).

We agree with Requester. First, Patent Owner's proposed construction essentially repeats what the claims recite, including "receiving a second user input specifying a navigation direction relative to the first location" (e.g., a system receiving a user input specifying a direction relative to a first location) and "determining a second location based on the user specified navigation direction" (e.g., determining a new, second location

based on the specified direction) recited in claim 1. Second, the examples provided for the Navigational Direction Limitations (e.g., the user input specifies a direction east of the first location and being eight meters east of the first location) are just that—particular embodiments (e.g., navigation direction being east and the second location to be eight meters east of the first location) found in the '025 patent's Specification. *See* the '025 patent 13:10–20

We will not import these particular embodiments into the claims. *See Phillips*, 415 F.3d at 1323 ("although the specification often describes very specific embodiments of the invention, [the Federal Circuit] ha[s] repeatedly warned against confining the claims to those embodiments.").

II. *New grounds based on prior art*

A. *Yee/Dykes*

The June 2021 Decision presented a new ground of rejection for claims 2–6, 8–10, 14–18, 20, 24, 26, 29, 33–38, 41, 42, 44–48, 51–54, 56–60, 63–68, and 70–72 under 35 U.S.C. § 103(a) based on Yee and Dykes. *See* Dec. 22–47, 58–59. Patent Owner argues claims 17, 33, and 67 as a group, claims 6, 18, 34, 35, and 68 as a group, and the remaining claims as a group. *See* Req. Reh'g 13–27. Patent Owner also disputes rationales for combining Dykes with Yee to arrive the features in the claims. *See id.* at 18–21, 24–26. We address each of these arguments below.

1. *Claims 17, 33, and 67*

Claims 17, 33, and 67 depend from canceled independent claims 13, 21, and 55 respectively. As such, each include the above discussed

Navigational Direction Limitations or similar recitations addressed above in Section I.C. The June 2021 Decision determine that Yee and Dykes teach these recitations found in claims 17, 33, and 67. *See* Dec. 23–34.

Patent Owner argues claims 17, 33, and 67 as a group. We select claim 33 as representative. *See* 37 C.F.R. § 41.37(c)(1)(iv).

Patent Owner asserts that: (1) Yee and Dykes do not teach "a second user input specifying a navigation direction relative to the first location" and "determining . . . a second location based on the user specified navigation direction" found in claim 21 and similarly found in dependent claim 33 (Req. Reh'g 13–18), and (2) the Decision does not articulate how Dykes modifies Yee to arrive at the claimed combination (*id.* at 18–21).

a. "a second user input specifying a navigation direction relative to the first location" and "determining . . . a second location based on the user specified navigation direction"

As previously discussed, claim 33 recites recitations similar to the Navigational Direction Limitations due to its dependency on a canceled independent claim 21. We further determine in Section I.C. that the phrase "receiving . . . a second user input specifying a navigation direction relative to the first location" in claim 21 includes receiving a user input specifying a direction relative to a first location and the phrase "determining . . . a second location based on the user specified navigation direction" includes determining a second location based on the specified direction relative to the first location.

Patent Owner argues that the June 2021 "Decision appears to find that the 'arrows' shown in 'VFC panorama:htd-018' and 'VFC panorama:mark

58' of Figure 4 of Dykes teach the 'a second user input specifying a navigation direction relative to the first location in the geographic area' as recited in claim 21." Req. Reh'g 14. More specifically, Patent Owner argues the arrows in the "VFC panorama:htd-018" and "VFC panorama:mark 58" of Dykes's Figure 4 provide links to other panoramic images and "corresponds to exactly one particular location" and are "without regard to how far these other locations may be from the location of the view shown in any particular viewer." *Id.* at 15; *see id.* at 13–15 (quoting Dec. 26; Dykes 141) (reproducing Dykes, Fig. 4). Based on Patent Owner's understanding, Patent Owner contends Dykes discloses only a "one-step process" instead of the recited "two-step process" (*id.* at 17) because (1) Dykes does not disclose symbols or arrows that "specify a 'navigation direction relative to the first location" using its argued claim construction, (2) Dykes's Figure 4 does not provide a scale, and (3) the hotspots in Figure 4 "are about one mile apart." *Id.* at 16; *see id.* at 15–18 (citing Dykes, Fig. 4).

As to the arguments (2) and (3), we did not import the eight meter example from the '025 patent's disclosure into the recitation "determining a second location based on the user specified navigation direction" found in claim 21 above in Section I.C. We thus determined that the recitation "determining a second location based on the user specified navigation direction" is not limited by a distance, and thus, Patent Owner's arguments related to scale (*see* Req. Reh'g 16) and the distance of the hotspots from each other (*see id.* at 15–17) are not commensurate in scope with the claims.

As to argument (1), a similar argument was made previously by Patent

Owner in a July 27, 2015 Request for Rehearing ("July 2015 Req. Reh'g") to a June 26, 2015 Decision ("June 2015 Decision"). In this rehearing request, Patent Owner contended that Dykes's arrow does not teach receiving a navigation direction relative to the first location. July 2015 Req. Reh'g 4–6. Although this was a newly presented argument, we noted that "Dykes teaches a user can navigate across the virtual space between recognized features (e.g., user input specifying a navigational direction relative to the first location) . . . ." March 1, 2016 Decision 6 (now vacated). Also, selecting an arrow to the right or the left of a given arrow within "VFC panorama:htd-018" and "VFC panorama:mark 58" of Figure 4 in Dykes suggests "receiving a second user input specifying a navigation direction" (e.g., right or left) "relative to [a] first location" contrary to Patent Owner's contentions. Thus, although each arrow corresponds to a particular location, when a user navigates right or left between different arrows within a panoramic image, for example, the specified "user input" is relative to another location and "specif[ies] a navigation direction" as recited in the canceled independent claim 21. *See* 3PR Comments 14–15 (citing Dykes 139–40, 142) (reproducing Dykes, Fig. 4)

Additionally, we underscore that the new ground does not just discuss the arrows in Dykes but also that Dykes teaches that the user can "*mov[e] the cursor right or left in the viewer around an arrow*." Dec. 26 (emphasis added) (citing Dykes 137–39, Fig. 3). For example, Dykes teaches "the incorporation and manipulation of multimedia objects such as images, *specifying actions associated with mouse/cursor interaction*" (Dykes 136–37 (emphasis added)), and "[r]elating horizontal locations along an image to

bearings from a point in this way *means that cursor movement in either the map or the image* can be linked to appropriate symbolism in the other view" (*id.* at 139 (emphasis added)). Additionally, Dykes discusses "[t]he process of selecting a section *v* of the panoramic image to view and representing the angle of the view with arrow symbols can be programmed to occur interactively *when the cursor is moved to the left or right in a viewer*." *Id.* at 137 (emphasis added). Although quoting the above-noted portion in the June 2021 Decision (Req. Reh'g 14), Patent Owner does not address the panel's discussion related to *moving a cursor right or left* (e.g., a specifying a navigation direction relative to a first location) in the viewer around the arrow. *See id.* at 13–18.

As to the assertion that Dykes only "teach[es] a one-step process in which a user may select a symbol on the map" (Req. Reh'g 17; *see id.* at 17–18, 20), we disagree. Following from the above discussion, Dykes also teaches or suggests the second step in the Navigational Direction Limitations (e.g., "determining . . . a second location based on the user specified navigation direction" step) in claim 21. For example, when a user navigates between different arrows within the "VFC panoraMap" or a panoramic image by moving a cursor to the right or left (e.g., "a navigation direction"), the specified "user input" (e.g., cursor movement) is relative to another location (e.g., right of left of "the first location") (Dykes 137–41, Fig. 4) and thus, Dykes at least suggests "determining a second location based on the user specified navigation direction specifying a navigation direction" as recited in canceled independent claim 21. Otherwise, Dykes would not be able to produce an image of the newly selected location. *See id.*

Additionally, as Requester explains, Dykes teaches a "waypoint symbol" (e.g., arrow) in the map or image is geo-referenced (*see* 3PR Comments 14–15 (citing Dykes 139–140, 142) (reproducing Dykes, Fig. 4)) and thus, for each user selection on a map (or image) associated with an arrow, Dykes at least suggests determining its location (e.g., GPS coordinates) based on the user selection (*see id.* at 14–16 (further citing Dykes 144)).

Accordingly, we are not persuaded that Dykes does not teach or suggest the Navigational Direction Limitations found in claim 33 or similarly recited in claims 17 and 67.

b. Reason with rational underpinning for combining Yee and Dykes

Patent Owner asserts the June 2021 Decision does not articulate clearly how Dykes modifies Yee to arrive at the emphasized limitations of claim 21— "a second user input specifying a navigation direction relative to the first location" and "determining a second location based on the user specified navigation direction." Req. Reh'g 18; *see id.* at 17–18. More specifically, "it is unclear how the 'micro-, meso- and m[a]cro-scale information' of Dykes would be inserted into the visual interface of Yee." *Id.* at 19.[8] Patent Owner also contends that if the teachings of Yee and Dykes were combined, the symbols corresponding to a particular location in the panoramic images "may be miles apart, thereby preventing these symbols or arrows of Dykes from being used for navigation through a geographic area." *Id.* at 19 (quoting Dec. 23–24). Patent Owner further

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[8] We note that the Decision incorrectly quoted Dykes. Dec. 23. Dykes states "[s]uch imagery is an excellent source of current micro-, meso- and macro-scale information (Fig. 1)." Dykes 132.

states that (1) collecting additional panoramic images using Dykes's technique "would be highly burdensome" (*id.* at 19) because this process would involve manually capturing images using a camera and tripod at each location (*see id.* at 19–20) and (2) placing arrows or symbols in Yee's views "would cause the visual interface of this combination to be unusable" (*id.* at 20; *see id.* at 20–21 (citing Yee 388–90, 392; Dykes, Fig. 4)).

Requester disagrees. 3PR Comments 17–18.

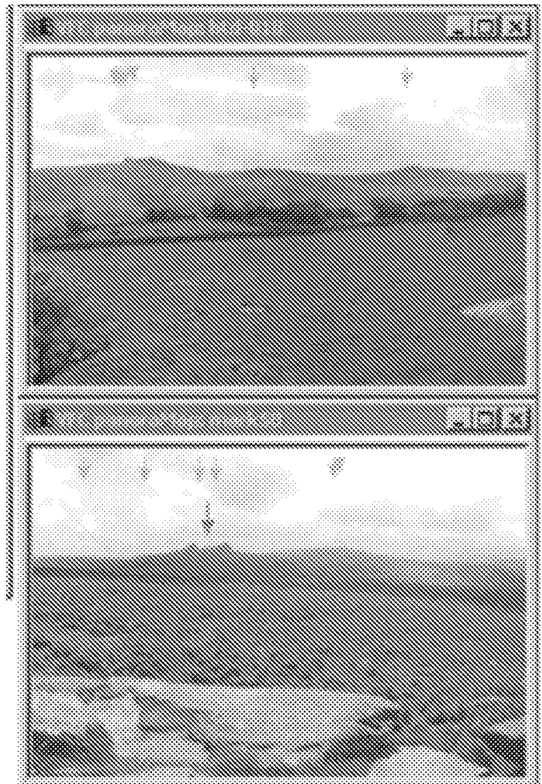
As noted by Requester (3PR Comments 18), Dykes's specific manner of including micro, meso or macro-scale information does not need to be incorporated in Yee's visual interface to render the claims obvious. *See In re Mouttet*, 686 F.3d 1322, 1332 (Fed. Cir. 2012) ("It is well-established that a determination of obviousness based on teachings from multiple references does not require an actual, physical substitution of elements."). Also, as further indicated in Figure 1 (Dykes 133), a panoramic image provides the "macro-scale topography, meso-scale features and micro-scale geology" (*id.*) and thus, the combination suggests to an ordinarily skilled artisan to include panoramic imagery into Yee's system (*see* Dec. 23–25) to assist with these goals.

Additionally, even assuming, without deciding, the "provided 'an excellent source of current micro-, meso- and m[a]cro-scale information'" (Dec. 23) rationale is unclear as argued (*see* Req. Reh'g 18), the June 2021 Decision provides several other reasons for combining Yee and Dyke, each of which has a rational underpinning to support an obviousness conclusion. *See* Dec. 23 (providing "educational aims" (citing Dykes 134)), 24 (being "useful . . . when evaluating sites, building, and characteristics of the

neighbourhood surrounding them" (citing Dykes 134)), 24 ("to help with orientation," and "improved Yee's visual interface by permitting the user to navigate within the virtual space and between recognized features") (citing Dykes 137, 139–41, Figs. 4, 6); *see also id.* at 28–29 (citing Dykes 137, 139–41, 146; RAN 11, 17; Request 122; 3PR Resp. Br. 13–14); 3PR Comments 17 ("a person of ordinary skill in the art would be motivated to combine the teachings put forward by Yee and Dykes to provide arrows in Yee's visual interface system (VIS) to help user orientation and create 'a real sense of spatiality and immersion that are the essence of virtual environments'") (citing Dykes 139); June 2015 Decision 19 (vacated) (stating "Dykes teaches a known technique for navigating and visualizing images of a geographic area, and one skilled in the art would have recognized that Dykes' teaching would improve on Yee's system in the same manner"). Notably, these rationales are not disputed by Patent Owner. *See* Req. Reh'g 17–21.

Other arguments in the Request for Rehearing amount to counsel's arguments, which cannot take the place of factually supported objective evidence. *See, e.g.*, *In re Huang,* 100 F.3d 135, 139–40 (Fed. Cir. 1996). For example, Patent Owner's assertion that Dykes's arrows or symbols are "miles apart" is speculative. *See* Req. Reh'g 19 (stating "these locations may be miles apart, thereby preventing these symbols or arrows of Dykes from being used for navigation through a geographic area" without citing to supporting evidence). Also, contrary to Patent Owner's assertions, at least some of the arrows or symbols shown in the panoramic images in Dykes's

Figure 4 shown below (VFCpanoraMap:htd-018 and VFCpanoraMap:mark58) provide evidence that the arrows are not miles.



Part of Dykes's Figure 4 showing VFCpanoraMap:htd-018 and VFCpanoraMap:mark58

See Dykes, Fig. 4.

As another example, Patent Owner asserts that the combination of Yee and Dykes would result in (1) an "enormous number of views captured by Yee" (Req. Reh'g 20), (2) arrows placed "in the views of Yee to indicate the locations of other views available in the database of Yee" (*id.*), and (3) "the symbols to cover the views with an enormous number of overlapping downward pointing arrows, making it difficult to distinguish one arrow from another and making it difficult for a user to predict or to control what new

view would opened when clicking on a particular arrow." But, these arguments too are speculative and presume that each image in Yee/Dykes combination would include arrows for every other view and object Yee captures and stores in its database. *See id.* at 20–21 (discussing Yee captures 30 frames per second while driving at 40–50 miles per hour) (citing Yee 390, 392). Moreover, Dykes's Figure 4 above illustrates that arrows are placed in desired locations, do not contain "an enormous number of overlapping" arrows as asserted (*id.* at 21), and thus, an ordinarily skilled artisan would have recognized including the arrows within Yee's system would have at least been an obvious variation given the references' collective teachings.

As for the remaining arguments, they are similar to arguments previously presented in this and related proceedings. For example, the argument that Yee and Dykes, when combined, would result in symbols being "miles apart" and would prevent the symbols or arrows of Dykes from being used to navigate through a geographic area (*id.* at 19 (quoting Dec. 23–24)) does not rebut sufficiently the obviousness rejection of the claims, which, as indicated above, do not limit the distance between locations specified by a user. As another example, related to Dykes's technique being allegedly burdensome because the Dykes's technique involves manually capturing images using a camera and tripod (*see id.* 19–20), this argument is misplaced because it presumes that Yee's image gathering approach is modified with Dykes's image acquisition technique. *See id.* As previously explained, this argument improperly "focus[es] on modifying Yee's image gathering approach with Dykes' image acquisition technique, which is not

how the rejection combines the teachings of Dykes and Yee." Dec. 31 (citing RAN 70; 3PR Resp. 16); *see also* Dec. 27 ("indicating that the rejection does not propose replacing Yee's image acquisition process with that of Dykes") (citing 3PR Resp. Br. 16).

For the reasons discussed above, we are not persuaded that the rejection fails to provide a reason with a rational underpinning to combine Yee and Dykes to arrive at the claims at issue, such that the Board misapprehended or overlooked a point in the newly presented ground.

2. Claims 6, 18, 34, 35, and 68

a. "[A] composite image"

Patent Owner argues that Yee alone or Yee and Dykes in combination do not disclose "a composite image" in claims 6, 18, 34, 35, and 68. Req. Reh'g 21–24. Patent Owner specifically argues that "Yee does not clearly disclose 'composite images' in accordance with the proper construction . . . under the *Phillips* standard." *Id.* at 22–23.[9] We disagree.

As stated in the June 2021 Decision,

> Yee addresses collected data made available with its product. Yee 389. The data includes provided various views, including "curbside view, front and back," "street view, front and back," "real estate view left and right," "real estate and addresss [sic] zoom, 4-view," *and* "composites of them." *Id.* Yee explicitly discloses "composites" (*id.*; *see* RAN 71) and "them" refers back to the other discussed views, including a front and back

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[9] As addressed in Section I.A, we determined that the phrase "composite image" consistent with the '025 patent and its plain and ordinary meaning is "a single image created by combining different image data or by uniting image data" and that "a single image" does not have to be a new image that depicts a single new view from a single location that is different from any of the views.

> curbside view, a front and back street view, and a left and right real estate view. Thus, Yee teaches creating "composites" of these various views.

Dec. 35; *see also* 3PR Comments 4 (stating "Yee explicitly used the term 'composite' in its disclosure."); *id.* at 4–5 (quoting Yee 389).

Regarding the GeoSpan Brochure[10] (Req. Reh'g 23–24), Patent Owner asserts its "composite view" and thus, Yee's "composite of them" (Yee 389) would "show[] four images," not "a single image." Req. Reh'g 24; *see id.* at 23 (reproducing the image in the GeoSpan Brochure on GEO_0000173). We are not persuaded. Although "GeoVista" and "GeoSpan" are discussed in Yee (*see, e.g.,* Yee 388, 392), there is insufficient evidence that the "4-way" view in the GeoSpan Brochure demonstrates the only possible 4-view that Yee creates. Also, the reproduced image in the Request for Rehearing (Req. Reh'g 23) is described as a "*4-way* Composite View" (*id.* (emphasis added)), whereas Yee describes the "4-view" as a separate view from the "composite of them" and other views. Yee 389; *see also* Dec. 36 (stating "the [language] 'composites of them' is *separate* from the '4-view' in Yee") (citing Yee 389).

Also, regardless of whether Lachinski provides insight into "what was meant by 'composite of them' in Yee" (Req. Reh'g 23), we find that Lachinski provides insight as to what Yee's "4-view" may be. The June 2021 Decision indicates "Lachinski is a patent issued to GeoSpan

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[10] DRIVE AROUND TOWN ON YOUR PC WITH GEOVISTA, VISUAL GEOGRAPHIC INFORMATION, GEO_0000172–177 (Exhibit A) ("the GeoSpan Brochure"). Patent Owner assert this reference was included in its January 8, 2013 Reply "as Appx1332." Req. Reh'g 23.

Corporation on May 27, 1997. 'GeoSpan' and a '4-view' are discussed in Yee."[11] Dec. 37 n.21 (citing Yee 388–89). We further noted the similarities between Yee and Lachinski. *See id.* at 38 (citing Yee 392; Lachinski 5:25–31, Fig. 3). Thus, as stated in the June 2021 Decision:

> Yee teaches and suggests that data from *the four images*, which includes its pixel data, *are used to create the single image frame* with reduced-sized images. This 'four views in a frame' in Yee (Yee 392) or the 'single video image' with four-views, each one-fourth of its original size that form 'reduced images,' as explained in Lachinski (Lachinski 5:25–31), *is a single image frame* that is made up of different parts or images (e.g., image data from multiple views) and unites pixel data from each of the different view image frames (e.g., processes image data from image frames at the level of pixel data) into a single image.

Dec. 38 (emphases added); *see also* Req. Reh'g 5 (stating "[a]nother example of a 4-view of Yee, as further explained in Lachinski,[] includes a *single* image made out of four reduced size images") (omitting footnote) (citing Yee 392; Lachinski 5:25-31, Fig. 3).

Lastly, Patent Owner's arguments (Req. Reh'g 22–24) overlook the Decision's further discussion of Dykes's teachings in this regard. The June 2021 Decision additionally states:

> Dykes teaches and suggests creating images that "are each a composite image" because of the reasons similar to those previously discussed when addressing claim 33. That is, Dykes

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[11] "Lachinski was introduced in Requester's February 6, 2013 Comments 23 'to explain Yee's teachings and to rebut Patent Owner's mischaracterization of Yee, which was permitted under § 1.948(a)(2). 3PR Resp. Br. 9." Dec. 37 n.21.

> teaches creating panoramas, which are single images created by combining and uniting different image data (e.g., the nine images in the upper left in Figure 2) through a stitching technique. *See* Dykes 134–36, Fig. 2. Dykes thus illustrates how images taken at different points can be stitched together to yield *a single, composite image*. *See* RAN 25 (citing Dykes 134–35, Fig. 2); *see also* 3PR Resp. Br. 18 (citing Dyke 135). Moreover, "Patent Owner admits that the panoramas in Dykes are composite images." PO Appeal Br. 19 (stating "Patent Owner admits that the panoramas of Dykes are composite images"). We refer to the previous discussion for more details related to Dykes's teachings for creating panoramas, for a motivation to combine this teaching with Yee, and for Patent Owner's arguments in this regard (PO Appeal Br. 23–24). The rejection therefore relies on both Yee and Dykes's teachings collectively to arrive at the claimed "composite image" of claims 6, 18, 34, 35, and 68. *See* 3PR Resp. Br. 19 (noting Patent Owner attacks Yee and Dykes individually).

Dec. 39 (emphasis added); *see also id.* at 25 (discussing combining Dykes stitching feature with Yee).

Accordingly, we are not persuaded that the rejection fails to demonstrate that Yee and Dykes teach or suggest a "composite image" as recited in claims 6, 18, 34, 35, and 68, such that the Board misapprehended or overlooked any point in the newly presented ground.

b. Reason with rational underpinning for combining Yee and Dykes

Patent Owner "submits that it is unclear why one of skill in the art would have combined the cited Yee and Dykes . . . to arrive at 'composite image' as properly construed under the *Phillips* standard." Req. Reh'g 24; *see id.* at 24–26 (quoting Dec. 40; Dykes 135) (reproducing Dykes, Fig. 2). Patent Owner argues that Dykes requires that there be a "small overlap"

between images, Yee does not disclose the "small overlap" feature allegedly required by Dykes, and it is thus not clear how Yee would be suitable for Dykes's stitching feature. *Id.* at 26.

We are not persuaded. As the Court states, "when a patent claims a structure already known in the prior art that is altered by the mere substitution of one element for another known in the field, the combination must do more than yield a predictable result." *KSR Int'l Co. v. Teleflex Inc.*, 550 U.S. 398, 417 (2007). As proposed (*see* Dec. 25, 39), combining Yee and Dykes to arrive at a "composite image" (e.g., a panoramic image) is no more than the simple substitution of one known element (e.g., Yee's "composites of them" (Yee 389)) for another (e.g., Dykes's composite image arrived at by stitching images together (Dykes 134–36, Fig. 2)) or "the mere application of a known technique to a piece of prior art ready for the improvement." *KSR*, 550 U.S. at 417.

Moreover, Patent Owner does not demonstrate adequately that the proposed combination would not yield the predictable result of a "composite image" as claims 6, 18, 34, 35, and 68 recite. *See* Req. Reh'g 24–26. As Requester indicates (*see* 3PR Comments 6–7), Yee captures many images, which would encompass the coverage needed to create Dykes's panoramic images. *See id.* at 7 (citing Yee 391) (noting Yee teaches 10 cameras capturing 63-degree horizontal, angled views). We further agree with Requester that Yee teaches or at least suggests to an ordinarily skilled artisan that some of its images would contain the needed overlap discussed in Dykes's stitching techniques (*see* Dykes 135) as evidenced by (1) the front, back, left, right, curbside, street, real estate, and address views (*see* Yee 389,

391), and (2) collecting data "looking globally" and "comprehensively" to "ensure[] no object is lost behind an obstruction" (*id.* at 390).

For the reasons discussed above, we are not persuaded that the rejection fails to provide a reason with a rational underpinning to combine Yee and Dykes and arrive at the claims at issue, such that the Board misapprehended or overlooked a point in the newly presented ground.

3. Remaining claims

Other than referencing the previous arguments made for canceled independent claims 1, 13, 21, 43, and 55, Patent Owner does not separately argue claims 2–5, 8–10, 14–16, 20, 24, 26, 29, 36–38, 41, 42, 44–48, 51–54, 56–60, 63–66, and 70–72. Req. Reh'g 26–27. We are not persuaded for the reasons previously discussed.

Conclusion

For the foregoing reasons, Patent Owner has not identified a point that the panel misapprehended or overlooked in entering the new ground of claims 2–6, 8–10, 14–18, 20, 24, 26, 29, 33–38, 41, 42, 44–48, 51–54, 56–60, 63–68, and 70–72 under 35 U.S.C. § 103(a) based on Yee and Dykes.

B. *Ishida/Dykes/Yee*

Claims 28, 29, 51, and 63 are rejected under 35 U.S.C. § 103(a) based on Ishida, Dykes, and Yee. Decision 47–57. Regarding the combination of Ishida, Dykes, and Yee, Patent Owner argues: (1) Ishida does not teach the Web Page Limitations in claim 28 because Ishida does not disclose displaying information as a web page (Req. Reh'g 27–30) and (2) the Decision does not clearly articulate how the teachings of Ishida, Dykes, and Yee would be combined to arrive at claims 29, 51, and 63 (*id.* at 30–33).

1. The Web Page Limitations in Claim 28

Patent Owner argues that Ishida does not disclose invoking a display of a web page for the retail establishment under its proposed construction because it only discusses displaying information collected from web pages. Req. Reh'g 28–29 (citing Dec. 50–51; Ishida 24, 28–29). Patent Owner further argues Ishida does not use a web browser to display the web page. *Id*. at 30 (citing Ishida 32–33).

As to the latter argument, we are not persuaded. Based on our construction in Section I.B, claim 28 does not require using a web browser to "invok[e] . . . a display of the web page on the display screen" as claim 28 recites.

Regarding whether Ishida discloses "invoking . . . a display of the web page [for the retail establishment] on the display screen" as claim 28 recites, we also are not persuaded by Patent Owner's arguments. To be sure, Ishida does not use the term "web page" explicitly when discussing its digital city. However, Ishida discusses "a 3DML WEB plug-in" (Ishida 27), "any site on the WEB" (*id.*), and "a WEB and ftp interface" (Ishida 28) when addressing "a human interface to Digital City Kyoto that combines 2D maps with several 3DML spots." *Id.* at 27; *see also* Dec. 50 (stating Ishida's social information infrastructure "integrates both World Wide Web archives and real-time information related to the city *into WEB and ftp interface* (e.g., the interface or second layer) on the Internet") (emphasis added) (citing Ishida 23–25, 28, Fig. 1; 3PR July 2015 Reh'g Request 8–9 (discussing Ishida's three-layer model)), 50–51 (stating "each of these web pages in Ishida (e.g., WEB and ftp interface) . . . ."), 53 (stating "Ishida's WEB interface

generates a digital city (e.g., a web page)"). Additionally, Ishida describes its digital city as "the Digital City Kyoto *site* . . . ." Ishida 31 (emphasis added).

These portions of Ishida suggest to an ordinarily skilled artisan that its digital city and web interface displayed on a user's screen is a web page. Alternatively, these portions in Ishida at least suggest to an ordinarily skilled artisan that using a web page to display the information in Ishida's interface would have been an obvious variant in light of the similar functionality of displaying web information. *See KSR*, 550 U.S. at 417 ("When a work is available in one field of endeavor, design incentives and other market forces can prompt variations of it, either in the same field or a different one. If a person of ordinary skill can implement a predictable variation, § 103 likely bars its patentability."). Also, a person of ordinary of skill would have had good reasons to pursue displaying Ishida's interface as a web page because this technique was known as evidenced by Ishida. *See* Ishida 31 (discussing "the WEB environment" and "bring[ing] up web pages"). As such, Ishida at least suggests the recited "invoking . . . a display of the web page on the display screen" as claim 28 recites.

Patent Owner fails to address these passages in Ishida in the Request for Rehearing. Rather, Patent Owner only quotes portions of the June 2021 Decision discussing that Ishida collects data from various web pages. *See* Req. Reh'g 28–29. Moreover, Requester provides another example where a tour guide agent can bring up web pages. 3PR Comments 9–10 (citing

Ishida 9[12]) (reproducing Ishida, Fig. 6). Given that Figure 6 shows the city project includes a web browser to present the information on the display screen, Ishida at least suggests that Ishida's digital city "invok[es] . . . a display of the web pages on the display screen" as claim 28 recites.

Accordingly, we are not persuaded that the rejection fails to demonstrate that Ishida, Dykes, and Yee teach or suggest "invoking . . . a display of the web page on the display screen" as recited in claim 28, such that the Board misapprehended or overlooked a point in the newly presented ground based on Ishida, Dykes, and Yee.

2. Reason with rational underpinning related to claims 29, 51, and 63

Claim 29 ultimately depends from independent claim 21 and recites "invoking by the computer system a display of an icon in association with the particular one of the objects, wherein the user selection is actuation of the icon." The '025 patent 18:49–52. Claims 51 and 63 ultimately depends from independent claims 43 and 55 and recite similar recitations to claim 29. *Id.* at 20:41–45, 22:1–5. We select claim 29 as representative. *See* 37 C.F.R. § 41.37(c)(1)(iv).

Patent Owner "submits that it is unclear from the Decision how one skilled in the art would combine the teachings of Ishida, Dykes, and Yee to arrive at the claimed embodiment[] of claim 29." Req. Reh'g 31; *see id.* at 31–33. Patent Owner argues that the June 2021 Decision "appears to

[12] Requester refers to the pages in Ishida differently in its appeal brief and the Request. *Compare* 3PR Appeal Br. 15 (citing Ishida 3, 7), *with* Request 156–57 (quoting Ishida 25–27). We use similar page numbering to the Request. For example, in the above citation, page 3 cited in the Requester's Appeal Brief is page 25.

equate" Ishida's "moving objects" with the recited "icon" (*id.* at 31 (citing Dec. 57)), but the claims

> state that the icon is displayed 'in association with the particular one of the objects' where the antecedent basis for 'the particular one of the objects' is 'a particular one of the objects *depicted in the first image*' (emphasis added), as recited in claims 27, 49, and 61, respectively, for claims 29, 51, and 63.

Id. at 31–32. Patent Owner further argues that images captured by Yee would be static, would not include animations of moving objects, and would not represent real activities in a physical city. *Id.* at 32 (citing Ishida 25). Patent Owner even further argues that "there is no apparent reason why one of skill in the art would combine the teachings of Ishida, Dykes, and Yee to arrive at the claimed embodiment[]" of claim 29. *Id.* at 32–33.

We are not persuaded. First, the new ground of rejection for claim 29 "adopt[ed] Requester's findings and conclusions how Ishida, Dykes, and Yee teach or suggest the recitations in these claims." Dec. 56 (citing 3PR Appeal Br. 18 (further citing Dykes 139), 20 (further citing "Section VIII.B.1 of the August Comments"; Request 154–156; Lachinski 2:47–50, 3:32–37, 9:42–46, 12:52–65, 13:56–63, 16:40–50), 28 (referring to claim 29, Section VIII.B.4, and Subsection 7)). As Requester explains (*see* 3PR Comments 11), this adopted ground of rejection discusses Dykes's teaching related to hot-linked symbols within a panorama to teach the recited "display of an icon in association with the particular one of the objects" and clicking the symbols to teach the recited "user selection is actuation of the icon" as claim 29 recites. *See* 3PR Comments 11–12 (quoting Dykes 139); *see also* 3PR Appeal Br. 18 (citing Dykes 139) (discussing Dykes's "hot-linked symbols

within a panorama”). The ground further refers to the Request (3PR Appeal Br. 20), which provides a reason with a rational underpinning for combining Dykes with Ishida. *See* Request 155–56 (stating “a person of ordinary skill in the art would be motivated to combine the teachings put forward by Ishida and Dykes to provide a system for creating a navigable digital city by providing 2-dimensional (2D) and 3-dimensional (3D) views of a larger city by providing navigation images collected using Dykes’ teachings.”). The above reason containing a rational underpinning has not been disputed by Patent Owner for teaching claim’s 29 limitations. *See* Req. Reh’g 31–33.

Second, the ground of rejection *additionally* cites to Ishida’s teaching related to animation. *See* Dec. 57 (stating “*[a]lso,* Ishida teaches including moving objects, such as cars, buses, and trains (e.g., ‘display of an icon in association with the particular one of the objects’ depicted in an image), within its interface layer having 2D maps and 3D virtual spaces and that these objects can be clicked to communicate with it (e.g., ‘the user selection is actuation of the icon’). Ishida 25.”) (emphasis added). Although the objects captured in Yee’s images (*see* Yee 389) may be static, we fail to see why Ishida’s teachings related to *representing* objects (e.g., buses) as moving objects cannot be included with the images captured by Yee that include various objects and data. *See* Yee 389. As one example, the “animation” of “moving objects” in Ishida (Ishida 25) may include a flashing object within the image. Moreover, the June 2021 Decision provides a reason with a rational underpinning for the proposed combination, including to allow users to communicate with the objects (*see* Dec. 51) and further to demonstrate dynamic activities in a virtual city. *See*

Ishida 25.

For the reasons discussed above, we are not persuaded that the ground of rejection fails to provide a reason with a rational underpinning to combine Ishida, Dykes, and Yee to arrive at the claims at issue, such that the earlier panel misapprehended or overlooked a point in the newly presented ground.

Conclusion

For the foregoing reasons, Patent Owner has not identified a point that the Board misapprehended or overlooked in entering the new ground under 35 U.S.C. § 103(a) based on Ishida, Dykes, and Yee for claims 28, 29, 51, and 63.

CONCLUSION

We have granted the Request for Rehearing to the extent that we have reconsidered the Decision in light of Patent Owner's Request for Rehearing, but have denied the Request for Rehearing in all other respects.

Outcome of Decision on Rehearing:

Claims	35 U.S.C §	Reference(s)/Basis	Denied	Granted
2–6, 8–10 14–18, 20, 24, 26, 28, 33–38, 41, 42, 44–48, 51–54, 56–60, 63–68, 70–72	103(a)	Yee, Dykes	2–6, 8–10 14–18, 20, 24, 26, 29, 33–38, 41, 42, 44–48, 51–54, 56–60, 63–68, 70–72	
28, 29, 51, 63	103(a)	Ishida, Dykes, Yee	28, 29, 51, 63	

Overall Outcome			2–6, 8–10, 14–18, 20, 24, 26, 28, 29, 33–38, 41, 42, 44–48, 51–54, 56–60, 63–68, 70–72	

Final Outcome of Appeal after Rehearing:

Claims	35 U.S.C. §	Reference(s)/Basis	Affirmed	Reversed	New Ground
24, 26, 28, 29, 37, 38, 41, 42, 44–48, 51–54, 63[13]				24, 26, 28, 29, 37, 38, 41, 42, 44–48, 51–54, 63	
2–6, 8–10 14–18, 20, 33–36, 56–60, 64–68, 70–72	103(a)	Yee, Dykes		2–6, 8–10, 14–18, 20, 33–36, 56–60, 64–68, 70–72	2–6, 8–10, 14–18, 20, 24, 26, 29, 33–38, 41, 42, 44–48, 51–54, 56–60,

[13] These claims previously were confirmed or found patentable by the Examiner. *See* Dec. 58–59.

					63–68, 70–72
28, 29, 51, 63	103(a)	Ishida, Dykes, Yee			28, 29, 51, 63
Overall Outcome				2–6, 8–10, 14–18, 20, 24, 26, 28, 29, 33–38, 41, 42, 44–48, 51–54, 56–60, 63–68, 70–72	2–6, 8–10, 14–18, 20, 24, 26, 28, 29, 33–38, 41, 42, 44–48, 51–54, 56–60, 63–68, 70–72

Requests for extensions of time in this *inter partes* reexamination proceeding are governed by 37 C.F.R. § 1.956. *See* Manual of Patent Examining Procedure (MPEP) § 2665; *see also* 37 C.F.R. § 41.79.

DENIED

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The time period for reply, if any, is set in the attached communication.

PTOL-90A (Rev. 04/07)

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

GOOGLE INC.
Requester,

v.

Patent of VEDERI, LLC.
Patent Owner.

Appeal 2016-006116
Reexamination Control 95/000,682
Patent 7,239,760 B2
Technology Center 3900

Before JOHN A. JEFFERY, DENISE M. POTHIER, and ERIC B. CHEN, *Administrative Patent Judges*.

POTHIER, *Administrative Patent Judge*.

DECISION ON REQUEST FOR REHEARING

STATEMENT OF THE CASE

This proceeding involves U.S. Patent No. 7,239,760 B2 ("the '760 patent"), which expired on January 11, 2021. Dec. 2.[1] This proceeding is also related to Reexamination Control Nos. 95/000,681, 95/000,683, 95/000,684, involving U.S. Patent Nos. 7,805,025 B2, 7,577,316 B2, and 7,813,596 B2 respectively, all of which have also expired.

This proceeding returns to the Board on remand from the Court of Appeals for the Federal Circuit, which vacated previous the Board decisions in this proceeding mailed June 26, 2015, July 16, 2015, and September 27, 2016. *Vederi, LLC v. Google LLC*, 813 F. App'x 499, 501 (Fed. Cir. 2020); *see also* Dec. 1–2. On remand, another panel[2] rendered a Decision on Appeal on June 1, 2021 ("the June 2021 Decision"), (1)(a) affirming the Examiner's determination not to adopt the proposed rejection of claim 8 under 35 U.S.C. § 102(a) based on Al-Kodmany but (b) reversing the confirmation or patentability of claims 2, 3, 8, 12–18, 21–26, 29, and 32–37 on other grounds, and (2) entering new grounds of rejection under 37 C.F.R. § 41.77(b) for (a) claims 2, 3, 12–18, 21–26, 29, and 32–37 under 35 U.S.C.

[1] Throughout this Opinion, we refer to: (1) the Request for *Inter Partes* Reexamination ("Request") filed August 17, 2012, (2) the Right of Appeal Notice ("RAN") mailed September 24, 2013, (3) the Examiner's Answer ("Ans.") mailed July 9, 2014, (4) Patent Owner's Request to Reopen Prosecution Under 37 C.F.R. § 41.77(b)(l) (PO Reopen Request) filed July 27, 2015, (5) the Examiner's Determination (Ex. Deter.) mailed January 8, 2016, (6) the Board's Decision mailed June 1, 2021 ("Dec."), (7) Patent Owner's Request for Rehearing ("Req. Reh'g") filed July 1, 2021, and (8) Requester's Comments in Opposition to Patent Owner's Request for Rehearing ("3PR Comments") filed August 2, 2021.
[2] The panel included Judges Pothier, Chen, and Branch.

§ 103(a) based on Shiffer[3] and Yee[4] and (b) claim 8 under 35 U.S.C. § 103(a) based on Shiffer, Yee, and Lachinski.[5] Dec. 4, 14, 30, 33.

In response to the new grounds, Patent Owner requested rehearing under on 37 C.F.R. § 41.79 ("Request for Rehearing") on July 1, 2021. Requester responded with comments pursuant to 37 C.F.R. § 41.79(c) ("3PR Comments") on August 2, 2021.

We have reconsidered the June 2021 Decision in light of Patent Owner's contentions in the Request for Rehearing. Patent Owner sets forth reasons why the earlier panel allegedly misapprehended or overlooked points in entering the new grounds of rejection. As discussed below, we maintain the determinations made in the June 2021 Decision.

DISCUSSION

"The request for rehearing must address any new ground of rejection and state with particularity the points believed to have been misapprehended or overlooked in entering the new ground of rejection and also state all other grounds upon which rehearing is sought." 37 C.F.R. § 41.77(b)(2) (2020); *see also* 37 C.F.R. § 41.79(b)(1) (2020).

Patent Owner argues that the June 2021 Decision does not construe two recitations in the claims of the '760 patent under their ordinary and

[3] Michael J. Shiffer, *Augmenting Geographic Information with Collaborative Multimedia Technologies*, 11 Proc. Auto Carto. 367–76 (1993) ("Shiffer").
[4] Frank Yee, *GPS & Video Data Collection In Los Angeles County: A Status Report, Position Location And Navigation Symposium*, Proc. IEEE Position Location and Navigation 388–93 (1994) ("Yee").
[5] U.S. 5,633,946, issued May 27, 1997 ("Lachinski").

customary meanings. Req. Reh'g 2–5. These recitations include "a second user input specifying a navigation direction relative to the first location" and "determining a second location based on the user specified navigation direction" ("the Navigational Direction Limitations") in canceled independent claim 1 and similarly found in canceled independent claim 20.[6] *See id.*; *see also* Dec. 3 (noting claims 1 and 20 have been canceled).

Patent Owner also asserts that: (1) Shiffer and Yee do not teach the Navigational Direction Limitations found in claim 1 and similarly found in claim 20, including Shiffer's navigation images (Req. Reh'g 5–10), (2) Shiffer's panning and zooming do not specify a navigation direction relative to a first location (*id.* at 10–12), and (3) it is unclear how an artisan would generate a 360-degree axial view as Shiffer discusses using Yee's captured images (*id.* at 12–13). Regarding the combination of Shiffer, Yee, and Lachinski, Patent Owner further argues: (1) there is no connection between Figures 2 and 3's features in Shiffer to arrive at claim 8's recitations (*id.* at 13–15), and (2) the Decision does not identify the portions of Shiffer that teach the recitations found in claim 8 (*id.* at 15).

Requester disagrees. *See generally* 3PR Comments 1–8. We address each of Patent Owner's contentions below.

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[6] As previously explained, independent claims 1 and 20 have been canceled. Dec. 3. However, each pending claim ultimately depends from one of claims 1 and 20 and thus includes the limitations found in one of these claims. *See* the '760 patent, 15:56–18:65.

ANALYSIS

I. *Claim construction*

"[A] second user input specifying a navigation direction relative to the first location in the geographic area" and "determining a second location based on the user specified navigation direction" in claim 1 and similarly found in claim 20

Canceled independent claim 1 recites the Navigational Direction Limitations. The '760 patent 16:3–7. Canceled independent claim 20 recites commensurate limitations. *Id.* at 17:48–52. Patent Owner argues claims 1 and 20 as a group. Req. Reh'g 2–4. We thus select claim 1 as representative. *See* 37 C.F.R. § 41.37(c)(1)(iv).

In the June 2021 Decision, the Board did not provide an explicit claim construction for the Navigational Direction Limitations. Patent Owner asserts an ordinarily skilled artisan would have understood that these recitations recite "a two-step process" "in which a system receives a user input specifying a direction relative to a first location (e.g., the user input specifies a direction east of the first location) and then determines a new, second location based on the specified direction (e.g., eight meters east of the first location)." Req. Reh'g 4; *see id.* at 3–4 (quoting the '760 patent 13:24–34) (reproducing the '760 patent, Fig. 16). Requester states that "Patent Owner's proffered construction mostly repeats the language of the claim" but "disagrees that Patent Owner's construction is proper, to the extent it is limited by the purported examples — 'a direction east of the first location' and 'eight meters east of the first location.'" 3PR Comments 3 (citing Req. Reh'g 4).

We agree with Requester. First, Patent Owner's proposed construction essentially repeats what claim 1 recites, including "receiving a second user input specifying a navigation direction relative to the first location" (e.g., a system receiving a user input specifying a direction relative to a first location) and "determining a second location based on the user specified navigation direction" (e.g., determining a second location based on the specified direction). Second, the examples for these recited phrases provided by Patent Owner are just that—particular embodiments (e.g., navigation direction being east and the second location to be eight meters east of the first location) found in the '760 patent's Specification. *See, e.g.*, the '760 patent 13:24–34. We will not import these particular embodiments into claim 1. *See Phillips v. AWH Corp.*, 415 F.3d 1303, 1323 (Fed. Cir. 2005) ("[A]lthough the specification often describes very specific embodiments of the invention, [the Federal Circuit] ha[s] repeatedly warned against confining the claims to those embodiments.").

We thus disagree that the Board overlooked or misapprehended an argument that the Navigational Direction Limitations in claim 1 and similar recitations in claim 20 was construed inconsistent with the '760 patent or its plain and ordinary meaning as an ordinarily skilled artisan would have understood it.

II. *New grounds based on prior art*

A. *Shiffer/Yee*

The June 2021 Decision presented a new ground of rejection for claims 2, 3, 12–18, 21–26, 29, and 32–37 under 35 U.S.C. § 103(a) based on Shiffer and Yee. *See* Dec. 14–26, 33.

Patent Owner argues canceled independent claims 1 and 20 as a group. Req. Reh'g 5–10. We thus select claim 1 as representative. *See* 37 C.F.R. § 41.37(c)(1)(iv).

Patent Owner argues that Shiffer and Yee do not teach "a first user input specifying a first location" and the Navigational Direction Limitations found in claim 1. Req. Reh'g 5–10. Patent Owner first argues selecting "a 'linear symbol'" in Shiffer's Figure 2 does not teach "specifying 'a first location in the geographic area' as recited in claims 1 and 20." *Id.* at 8; *see id.* at 6–9 (quoting Dec. 16, 18–19; Shiffer 372) (reproducing Shiffer, Fig. 2). In particular, Patent Owner asserts that the linear symbols in the "Neighborhood" window in Figure 2 (1) "extend[] for several city blocks" (*id.* at 8), (2) are routes, each "represent[ing] a large number of locations" (*id.* at 9 (citing Shiffer 372)), and (3) thus do not disclose "a first user input specifying a first location in the geographic area" as claim 1 recites. *See id.* at 8–9. Requester disagrees. 3PR Comments 3–4 (quoting Shiffer 372–373) (citing Shiffer 371; June 26, 2015 Dec. 12–13) (reproducing Shiffer, Fig. 2).

As stated in the June 2021 Decision, the Shiffer's navigation shots or images disclose:

> [A]llow[ing] users to drive or fly through the study area. They are designed to aid visual navigation by enabling the user to view a geographic area from a moving perspective such as that

> experienced when traveling through a region. Navigation images are represented on the map as linear symbols that represent the routes available to the user. They are illustrated as large arrows in the lower right window of Figure 2.

Dec. 16 (quoting Shiffer 372); *see also* 3PR Comments 3–4 (quoting the same). The June 2021 Decision further notes that Shiffer describes, in the context of Figure 3 that a user can "select[] appropriate arrows linked to the map" (Dec. 18 (quoting Shiffer 373, Fig. 3)), and that this teaching at least suggests for Shiffer's Figure 2, that a user would similarly select an appropriate arrow in its figure (*see id.* (citing Shiffer 372–73, Figs. 2–3)). Shiffer even further explains that the image in the "upper left corner of Figure 2 represents an oblique navigation image of *a selected street*." Shiffer 372 (emphasis added). Thus, although the linear symbols in Shiffer's "Neighborhood" image in Figure 2 may extend for several blocks as argued by Patent Owner, an ordinarily skilled artisan would have recognized the user selects or specifies a specific location (e.g., a street or a particular spot along the linear symbols) in Figure 2's map. Furthermore, the recited term "location" in claims 1 and 20 can encompass a street or region and is not limited to a particular building or object within the map as Patent Owner's arguments appear to imply.

Patent Owner next contends sliding the pointer in Shiffer's "Aerial Views" window of Figure 2 toward a controller's end to forward or reverse direction does not disclose "a navigation direction" in claim 1 under its plain meaning. Req. Reh'g 9. Specifically, Patent Owner argues the claimed feature enables specifying directions "without regard to the path along which the image frames were collected . . . and at substantially regular intervals."

Id. Patent Owner further contends Shiffer's navigation images are "confined to particular linear route" (*id.*) and "the forward and reverse directions of Shiffer may refer to different physical directions for different navigation images . . ., thereby increasing confusion for a user" (*id.* at 9–10). Patent Owner even further asserts "[t]his arrangement of the user interface of Shiffer does not allow [a] user to specify a navigation direction based on a current location, such as specifying a direction that is different from the route along which the images were captured." *Id.* at 10. Requester disagrees. 3PR Comments 2–4 (quoting Shiffer 372–373) (citing Shiffer 371; June 26, 2015 Dec. 12–13) (reproducing Shiffer, Fig. 2).

As discussed in Section I above, the plain meaning of the phrase "specifying a navigation direction relative to the first location in the geographic area" does not include a recitation that the navigation direction may be specified "at substantially regular intervals" (Req. Reh'g 9) or specified regardless of the path which the image frames were captured or collected (*see id.* at 10) as argued. Nor does the plain meaning of "specifying a navigation direction relative to the first location" include particular embodiments (e.g., navigation direction being east and the second location to be eight meters east of the first location) found in the '760 patent. *See* 3PR Comments 3 (stating "the claim language or the specification" does not "support . . . limiting these claim terms to any particular cardinal directions or particular distances between the two locations").

Given our claim construction, we fail to see how Shiffer's controller, which permits forward and reverse direction within an "Aerial Views" window (*see* Dec. 17 (quoting Shiffer 372–73) (reproducing Shiffer, Fig. 2

with an "Aerial Views" window in the upper left)), would somehow "increase[e] confusion for a user" as Patent Owner contends. Req. Reh'g 10; *see id.* at 9–10. As an example, the Board explained Shiffer:

> teaches or suggests controlling the direction of movement or flight through a geographic area (e.g., the geographic area identified by the large arrows in the "Neighborhood" window in Figure 2) from one location (e.g., the originally selected location) to another location by sliding the controller's pointer in a forward or reverse direction.

Dec. 19. As another example, the Board stated:

> A user can select a first location by sliding the controller's pointer in forward direction in Shiffer's Figure 2 (e.g., "receiving a first user input specifying a first location in the geographic area") and then, the user can specify a navigation direction (e.g., forward) relative to this first location by further sliding the controller's pointer in the forward direction in Shiffer's Figure 2 to control the flight direction through a region.

Id. (citing Shiffer 372–73, Fig. 2; Ex. Deter. 11–12).

Patent Owner further argues that Shiffer's panning and zooming feature of Shiffer's "360 degree axial view" relative to Figure 3 does not specify a navigational direction relative to a first location and determine a second location based on the user specified navigation direction. Req. Reh'g 10–12 (quoting Dec. 23; *id.* at 23 n.13 (defining "zoom")). Patent Owner argues that an ordinary skilled artisan would have understood that zooming does not perform "an operation other than magnifying the appearance of a subject of the image" consistent with the definition provided in the June 2021 Decision (*id.* at 11 (discussing a smartphone camera)) and "merely continues to represent the same direction as that prior to performing the

zoom operation" (*id.* at 12). Patent Owner further argues that Shiffer's panning feature "merely causes the view of the image to shift, such as by rotating or pivoting a camera left or right." *Id.* (citing Shifter 372).

Before addressing these arguments, we note that even if panning or zooming features are not found to teach the Navigational Direction Limitations, the above-discussed features found in Shiffer's Figure 2 (e.g., manipulating the controller and its pointer as described above) teach or suggest the recited features as previously discussed. *See* Dec. 24 ("In the event that selecting to zoom or pan an image as taught by Shiffer is not considered 'receiving second user input specifying a navigation direction relative to the first location' as canceled claims 1 and 20 recite (for which we disagree), Shiffer's Figure 2 and its discussed features as previously explained teach and suggest the Navigation Direction Limitation."); *see also* 3PR Comments 5 (stating "even if selecting to zoom or pan an image as Shiffer teaches is not 'receiving second user input specifying a navigation direction relative to the first location,' the 'navigation images' and flight control features in Shiffer's Figure 2 discloses the claim limitations at issue as discussed above") (citing Dec. 24).

Turning to the zooming feature in Shiffer, we disagree with Patent Owner's assertions. First, the argument related to zooming merely magnifies a portion of the image without changing location was not overlooked in the June 2021 Decision. *See* Dec. 23 ("Patent Owner contends one skilled in the art would not 'equate' Shiffer's zooming and panning feature to 'specifying a navigation direction' because the zooming feature 'merely magnifies that portion of the image without changing

locations' and 'does not move the viewer any closer to the landmark.'") (citing PO Reopen Request 27).

Second, the June 2021 Decision provided at least one definition of "zoom" to include "simulating movement away from or towards a location" (Dec. 23; *see id.* at 23 n.13) and thus, "an artisan of ordinary skill would have understood Shiffer's zooming feature would specify a 'navigation direction' relative to the original location (e.g., moves towards another location within the area as well as away from the original location)." *Id.* Although Patent Owner asserts an ordinary artisan would have understood zooming to merely magnify, it does not provide any further evidence to support this understanding. *See, e.g.*, Req. Reh'g 11 (quoting the same definition as the June 2021 Decision). To be sure, the definition provided in the June 2021 Decision includes "simulating" movement. But, the simulation still determines a second location based on the user specified navigation direction (e.g., movement towards an object from one spot to another). Whether or not a zoom feature actually requires the camera operator to move physically closer to a subject (*see id.*), has "limitations" (*id.*), or fails to "change the viewing direction . . . to specify a *different* navigation direction" (*id.* at 12 (emphasis added)) as argued is not commensurate in scope with claim 1's "a second user input specifying a navigation direction relative to the first location."

As to the panning feature in Shiffer, we also disagree with Patent Owner. In the June 2021 Decision, the Board noted that dependent claim 14 of the '760 patent includes "the navigation button," which "indicates direction of motion" (the '760 patent 17:1–2), and claim 15, which depends

from claim 14, further recites "the direction of motion includes one of panning left or right" and "rotating left or right" (*id.* at 17:4–6). *See* Dec. 23–24 (noting the same). The Board further found "consistent with the Specification of the '760 patent, Shiffer's panning feature suggests a navigation and moving direction or can 'specify[] a navigation direction' as recited" in claim 1. *Id.* at 24; *see id.* at 23–24 (citing Shiffer 373, Fig. 3).

Patent Owner contends "panning an image merely causes the view of the image to shift, such as by rotating or pivoting a camera left or right." *See* Req. Reh'g 12–13 (citing Shiffer 372). But, this contention does not address or rebut the Board's finding related to dependent claims 14 and 15 of the '760 patent, which include a rotating left or right as a moving direction of a navigation button. *See* 3PR Comments 5 (discussing claims 14 and 15 of the '760 patent). In any event, consistent with the definition of "pan" provided by Patent Owner,[7] Shiffer's teaching that a user "can navigate around a specific rendering by . . . panning with on-screen controls" (Shiffer 373, Fig. 3) (e.g., pivot or move either to the left or right along a horizontal plane) "specif[ies] a navigation direction relative to a first location" (e.g., right or left on the horizontal plane relative to the previous location).

Lastly, Patent Owner "submits that it is unclear how one of skill in the art would generate 360 degree axial views as described in Shiffer using images captured in accordance with Yee." Req. Reh'g 12. Patent Owner

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[7] Req. Reh'g 12 n.1 (defining *Pan*, The American Heritage® Dictionary, *available at* https://www.ahdictionary.com/word/search.html?q=pan (def. 3) ("*v.intr.* To pivot a movie camera along a horizontal plane in order to follow an object or create a panoramic effect.").

argues Yee's captured images cannot be used to generate "a 360 [degree] view that would allow a user to pivot a view to 'look at the surrounding area'" (*id.*) but rather only "captur[es] images from a fixed point of view with respect to its platform" (*id.* at 12–13 (citing Shiffer 372)).

We are not persuaded. This contention does not address or contest combining Shiffer's "Neighborhood" and "Aerial Views" windows in Figure 2 and Yee. As such, this particular combination and the reasons for combining (*see* Dec. 24–25) remain unchallenged. Also, Patent Owner cites to nothing in Yee that would prevent creating a 360 degree view. *See* Req. Reh'g 12–13 (citing only Shiffer 372). Yee teaches that its data collection should be able to "locate signs, potholes, bridges, utilizes and obstructions, looking <u>globally</u>" and "locate items hidden by trees and building, looking <u>comprehensively</u>." Yee 390. Yee further teaches "[f]or the comprehensive view, 30 video frames a second taken ensures no object is lost behind an obstruction while moving down the road." *Id.* Yee further discusses collecting images in all four directions. *Id.* As such, an ordinary skilled artisan would have recognized that Yee's image capturing technique would be able to generate Shiffer's 360 degree view to look at the surrounding area and without obstruction.

For the reasons discussed above, we are not persuaded that Shiffer and Yee do not teach "a first user input specifying a first location in the geographic area," the Navigational Direction Limitations in canceled independent claims 1 and 20, or that an ordinary skilled artisan would not know how to generate Shiffer's 360 degree axial views using Yee's image

capturing technique, such that we misapprehended or overlooked a point in entering the new ground based on Shiffer and Yee.

1. Claims 2, 3, 12–18, 21–26, 29, and 32–37

Claims 2, 3, and 12–18 ultimately depend from canceled independent claim 1, and claims 21–26, 29, and 32–37 ultimately depend from canceled independent claim 20. As such, each includes the limitations previously discussed. Patent Owner asserts the new ground of rejection for these claims should be withdraw because "these claims recite all of the terms and limitations of their base claim." Req. Reh'g 13. We are not persuaded for the above-stated reasons.

Additionally, Patent Owner asserts claims 2, 3, 12–18, 21–26, 29, and 32–37 have "other limitations which further distinguish these claims over the Shiffer and Yee references." *Id.* However, Patent Owner fails to identify what these further claim distinctions are or how the references fail to teach or suggest these purported differences. *See id.* Thus, we find this argument unavailing.

Conclusion

For the foregoing reasons, Patent Owner has not pointed out a point that the Board misapprehended or overlooked in entering the new ground for claims 2, 3, 12–18, 21–26, 29, and 32–37 under 35 U.S.C. § 103(a) based on Shiffer and Yee.

B. *Shiffer/Yee/Lachinski*

Claim 8 depends from canceled claim 1 and is newly rejected under 35 U.S.C. § 103(a) based on Shiffer, Yee, and Lachinski. Decision 26–30, 33. Regarding the combination of Shiffer, Yee, and Lachinski, Patent

Owner argues Shiffer's Figures 2 and 3 have disparate features related to "Automobile Traffic Analysis" on page 371 and "navigation images" on page 372 and Shiffer does not teach or suggest a connection between Figures 2 and 3's features to arrive at claim 8's recitations. Req. Reh'g 14–15 (citing Shiffer 371–72, Fig. 2). Patent Owner further argues that the June 2021 Decision does not identify the portions of Shiffer that teach the recitations found in claim 8. Req. Reh'g at 15.

As to the latter argument, we are not persuaded that the June 2021 Decision fails to identify portions of cited references that teach the three noted limitations quoted on page 15. *See id.* Notably, the new ground of rejection does not rely exclusively on Shiffer for claim 8's recitations. Rather, the ground turns to Yee and Lachinski in combination with Shiffer for teaching and suggesting its limitations, including "identifying a street segment," "identifying a position on a street segment," and "identifying an image associated with said position" found in claim 8. *See* Dec. 28–30 (citing Yee 388–92; Shiffer, Fig. 2; Lachinski 1:15–23, 2:16–20, 3:32–37, 9:36–45, 11:55–12:62, 13:55–63, 14:41–58, 16:33–17:38, Figs. 9–10); *see also* 3PR Comments 6 (stating "Patent Owner's Request ignores that the asserted unpatentability ground in the Board's June 1, 2021 Decision is not Shiffer alone, but the combination of Shiffer, Yee, and Lachinski"), 6–7 (quoting Dec. 28; Lachinski 3:32–37) (citing Dec. 29; Lachinski 2:47–50, 9:42–46, 12:52–65, 13:56–63). One cannot show nonobviousness by attacking references individually where the rejections are based on combinations of references. *See In re Merck & Co.*, 800 F.2d 1091, 1097 (Fed. Cir. 1986).

Additionally, as Requester notes (3PR Comments 7), the Federal Circuit has determined that "substantial evidence supports the Board's finding that the prior art discloses the disputed claim limitations" related to "'street segments' as required by some of the claims." *Vederi*, 813 F. App'x at 505.

Moreover, regarding combining features of Shiffer's Figure 2 and 3, we note that the new ground discusses that each of Figures 1–3 has interactive maps. *See* Dec. 27 (citing Shiffer 371–73) (noting Shiffer's Figure 1 allows for pointing at associated street links on the map, Shiffer's Figure 2 allows the user to drive or fly through an area, and Shiffer's Figure 3 allows the user to move through images). Thus, the record shows "a connection" (Req. Reh'g 14) between Shiffer's Figures 2 and 3. *See also* Shiffer, Figs. 2–3 (both showing interactive maps). Thus, applying Figure 3's (as well as Figure 1's) interactive teachings related to pointing to a street link or sequentially moving through images (*see id.*) to Shiffer's Figure 2 map yields no more than predictable result of permitting a user to specify a first and second location in a geographic area and further identify a segment of a street that includes the first and second location. This combination of teachings would be no more than a combination of familiar elements according to known methods in the prior art. *See KSR Int'l Co. v. Teleflex Inc.*, 550 U.S. 398, 416 (2007); *see also* Dec. 27 (stating "an ordinary skilled artisan would have recognized that Shiffer suggests further 'identifying an image associated with said position [on a street segment corresponding to the first or second location]' as claim 8 recites").

As to the argument that Shiffer's Figure 2 only permits selecting a linear symbol along a particular linear route and thus fails to teach claim 8 (*see* Req. Reh'g 15), we are not persuaded for the reasons previously discussed. To reiterate, this argument is not commensurate in scope with claim 1's or 8's limitations, which require no more than "identifying an image associated with said position" corresponding to a first or second location. *See* the '760 patent 16:38–45.

Lastly, Patent Owner argues Shiffer's Figure 1 on page 371 does not retrieve navigation images based on a selected street link but only retrieves traffic data. Req. Reh'g 15. Granted, Shiffer's "Automobile Traffic Analysis" embodiment retrieves traffic data and not navigation images. Shiffer 371. However, as previously explained, the rejection proposes to *combine* Shiffer's teaching related to pointing or selecting an associated street link, as discussed in the context of Figure 1, to Shiffer's Figure 2 to provide and allow the user to drive or fly through the study area in its navigation images. *See* Dec. 27 (stating "[b]y applying these teachings to Shiffer's Figure 2's map and navigation images that allow a user to drive or fly through a study area, an ordinary skilled artisan would have recognized that Shiffer suggests further 'identifying an image associated with said position [on a street segment corresponding to the first or second location]' as claim 8 recites").

For the reasons discussed above, we are not persuaded that the new ground of rejection based on Shiffer, Yee, and Lachinski fails to teach or suggest claim 8's recitations, such that the earlier panel misapprehended or overlooked a point in entering the new ground.

Conclusion

For the foregoing reasons, Patent Owner has not pointed out a point that the Board misapprehended or overlooked in entering the new ground under 35 U.S.C. § 103(a) based on Shiffer, Yee, and Lachinski for claim 8.

CONCLUSION

We have granted the Request for Rehearing to the extent that we have reconsidered the June 2021 Decision in light of Patent Owner's Request for Rehearing, but have denied the Request for Rehearing in all other respects.

Outcome of Decision on Rehearing:

Claims	**35 U.S.C §**	**Reference(s)/Basis**	**Denied**	**Granted**
2, 3, 12–18, 21–26, 29, 32–37	103(a)	Shiffer, Yee	2, 3, 12–18, 21–26, 29, 32–37	
8	103(a)	Shiffer, Yee, Lachinski	8	
Overall Outcome			2, 3, 8, 12–18, 21–26, 29, 32–37	

Final Outcome of Appeal after Rehearing:

Claims	35 U.S.C. §	Reference(s)/Basis	Affirmed	Reversed	New Ground
8[8]	102(a)	Al-Kodmany	8		
2, 3, 8, 12–18, 21–26, 29, 32–37[9]	103(a)	Shiffer, Yee		2, 3, 8, 12–18, 21–26, 29, 32–37	2, 3, 12–18, 21–26, 29, 32–37
8	103(a)	Shiffer, Yee, Lachinski			8
Overall Outcome				2, 3, 8, 12–18, 21–26, 29, 32–37	2, 3, 8, 12–18, 21–26, 29, 32–37

Requests for extensions of time in this *inter partes* reexamination proceeding are governed by 37 C.F.R. § 1.956. *See* Manual of Patent Examining Procedure (MPEP) § 2665; *see also* 37 C.F.R. § 41.79.

<u>DENIED</u>

[8] This claim previously was not rejected by the Examiner. *See* Dec. 33.
[9] These claims previously were not rejected by the Examiner. *See* Dec. 33.

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The time period for reply, if any, is set in the attached communication.

PTOL-90A (Rev. 04/07)

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

GOOGLE INC.
Requester,

v.

Patent of VEDERI, LLC.
Patent Owner.

Appeal 2018-007271
Reexamination Control 95/000,683
Patent 7,577,316 B2
Technology Center 3900

Before JOHN A. JEFFERY, DENISE M. POTHIER, and ERIC B. CHEN, *Administrative Patent Judges*.

POTHIER, *Administrative Patent Judge*.

DECISION ON REQUEST FOR REHEARING

STATEMENT OF THE CASE

This proceedings involves U.S. Patent No. 7,577,316 B2 ("the '316 patent), which expired on January 11, 2021. Dec. 2.[1] This proceeding is also related to Reexamination Control Nos. 95/000,681, 95/000,682, and 95/000,684, involving U.S. Patent Nos. 7,805,025 B2, 7,239,760 B2, and 7,813,596 B2 respectively, all of which have also expired.

This proceeding returns to the Board on remand from the Court of Appeals for the Federal Circuit, which vacated previous Board decisions for this proceeding mailed August 15, 2016 and September 28, 2018. *Vederi, LLC v. Google LLC,* 813 F. App'x 499, 501, 505 (Fed. Cir. 2020); *see* Dec. 2. On remand, another panel[2] rendered a Decision on Appeal ("the June 2021 Decision") on June 1, 2021, (1) reversing the rejections of claims 13 and 18–24 based on various references, including Dykes,[3] Al-Kodmany,[4]

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[1] Throughout this Opinion, we refer to: (1) the Request for *Inter Partes* Reexamination ("Request") filed August 20, 2012, (2) the Right of Appeal Notice (RAN) mailed September 24, 2013, (3) the Patent Owner's Appeal Brief (PO Appeal Br.) filed December 24, 2013, (4) the Requester's Appeal Brief (3PR Appeal Br.) filed September 8, 2014, (4) the Board's Decision mailed June 1, 2021 ("Dec."), (10) Patent Owner's Request for Rehearing ("Req. Reh'g") filed July 1, 2021, and (11) Requester's Comments in Opposition to Patent Owner's Request for Rehearing ("3PR Comments") filed August 2, 2021.

[2] The panel included Judges Pothier, Chen, and Branch.

[3] J. Dykes, *An Approach To Virtual Environments For Visualization Using Linked Geo-referenced Panoramic Imagery,* 24 Computers, Env't & Urb. Sys. 127–52 (2000) ("Dykes").

[4] Kheir Al-Kodmany, *Using Web-Based Technologies and Geographic Information Systems in Community Planning*, 7 J. Urb. Tech. 1–31 (2000) ("Al-Kodmany").

Bates,[5] Yee,[6] Murphy,[7] and Shiffer,[8] and (2) entering a new ground of rejection under 37 C.F.R. § 41.77(b) for claims 13 and 18–24 based on Yee, Lachinski,[9] and Dykes under 35 U.S.C. § 103(a). Dec. 4, 22–41.

In response to the new ground, Patent Owner requested rehearing under 37 C.F.R. § 41.79 ("Request for Rehearing") on July 1, 2021. Requester responded with comments pursuant to 37 C.F.R. § 41.79(c) ("3PR Comments") on August 2, 2021.

We have reconsidered the Decision in light of Patent Owner's contentions in the Request for Rehearing. Patent Owner sets forth reasons why the earlier panel allegedly misapprehended or overlooked points in entering the new ground of rejection. As discussed below, we maintain the determinations made in the June 2021 Decision.

DISCUSSION

"The request for rehearing must address any new ground of rejection and state with particularity the points believed to have been misapprehended or overlooked in entering the new ground of rejection

[5] Nada Bates-Brkljac & John Counsell, *Issues in Participative Use of an Historic City Millennial Web Site*, IEEE Proc. Int'l Conf. Info. Visualization 119–25 (2000) ("Bates").
[6] Frank Yee, *GPS & Video Data Collection In Los Angeles County: A Status Report, Position Location And Navigation Symposium,* Proc. IEEE Position Location and Navigation 388–93 (1994) ("Yee").
[7] U.S. 6,282,362 B1, issued Aug. 28, 2001 ("Murphy").
[8] Michael J. Shiffer, *Augmenting Geographic Information with Collaborative Multimedia Technologies*, 11 Proc. Auto Carto. 367–76 (1993) ("Shiffer").
[9] U.S. 5,633,946, issued May 27, 1997 ("Lachinski").

and also state all other grounds upon which rehearing is sought." 37 C.F.R. § 41.77(b)(2) (2020); *see also* 37 C.F.R. § 41.79(b)(1) (2020).

Patent Owner argues that the June 2021 Decision does not construe several terms in the claims of the '316 patent under their ordinary and customary meanings. Req. Reh'g 2. These terms include "a composite image" in claims 13, 18, and 23 (*id.* at 2–8) and "an arbitrary address" in claim 20 (*id.* at 8–13). Patent Owner also asserts that: (1) Yee alone or Yee and Dykes in combination do not disclose "a composite image" in claims 13, 18, and 23 (*id.* at 13–19), (2) Yee, Lachinski, and Dykes do not teach the recited "arbitrary address" in claim 20 (*id.* at 19–21), and (3) Yee and Lachinski do not teach the limitations in claim 21 (*id.* at 21–23).

Requester disagrees. *See generally* 3PR Comments 2–12. We address each of Patent Owner's contentions below.

ANALYSIS

I. *Claim construction*

A. *"[A] composite image" in claims 13, 18, and 23*

The phrase "composite image" is found in claims 13, 18, and 23, each of which ultimately depends from canceled independent claim 1. The '316 patent 16:37–38, 16:56–57, 17:14–15. In the June 2021 Decision, the Board found this phrase means "a single image that may be created by comb[in]ing or uniting image data . . . ." Dec. 18–29.

Patent Owner asserts that the phrase "composite image," as defined in the June 2021 Decision, is "unclear" because "it does not define what is meant by 'single image.'" Req. Reh'g 3. Patent Owner argues that "single

image," consistent with the '316 patent's Specification, "would be understood to refer to a single image that is created by uniting those multiple image frames into a single image." *Id.* Patent Owner further argues that "a composite image" "[a]s used in the Vederi patents" (1) "depicts a single new view of the objects in the geographical area" (*id.* (citing the '316 patent, 5:54–61, 9:10–21)), (2) "[t]he single new view is different from any of the views depicted in any one of the individual image frames prior to forming the composite image" (*id.* (citing the '316 patent 2:37–39, 5:47–51)), and (3) "would not encompass a collage of disparate images," including "a two-by-two grid of views of four different participants on a video conference" (*id.* at 7–8). For support, Patent Owner quotes and cites to various passages of the '316 patent. *See id.* at 3–7 (quoting the '316 patent, Abstract, 1:27–57, 2:10–12, 2:19–20, 2:33–39, 3:46–49, 5:45–51) (citing the '316 patent 2:37–39, 3:54–57, 5:47–51, 5:54–6:5, 9:10–21) (reproducing the '316 patent, Fig. 16; Provisional Application No. 60/238,490, Fig. 11). Patent Owner concludes that "composite image," under *Phillips*[10] and consistent with the '316 patent, "refers to a single image created by combining different image data or by uniting image data[,] where the single image provides a single view." *Id.* at 8.

Requester asserts Patent Owner's arguments were previously rejected by the Board and the Federal Circuit. *See* 3PR Comments 2–4 (citing *Vederi*, 813 F. App'x at 503; Dec. 16; the '316 patent 5:66–6:1). Additionally, Requester asserts Patent Owner is attempting to limit the

[10] *Phillips v. AWH Corp.*, 415 F.3d 1303 (Fed. Cir. 2005).

phrase "composite image" "to cover only narrow preferred embodiments in the specification." *Id.* at 4 (citing Dec. 17).

The Board gave the claim recitations in the '316 patent "'their ordinary and customary meaning' as would have been understood by 'a person of ordinary skill in the art in question at the time of the invention.'" Dec. 9 (quoting *Phillips,* 415 F.3d at 1312–13); *see id.* at 16 nn.11–13 (addressing the term "composite") (citing Merriam-Webster's Online Dictionary (11th ed.)). Additionally, the Board stated "[c]laims 'must be read in view of the specification, of which they are a part'" and that "the specification 'is always highly relevant to the claim construction analysis.'" *Id.* at 9 (quoting *Phillips,* 415 F.3d at 1315 (citations omitted)). Consistent with these principles, the Board considered how the Specification describes a "composite image" in arriving in its claim construction. *See id.* at 15–16 (citing the '316 patent, Abstract, 2:20–22, 2:33–35, 3:46–49, 5:45–47, 5:66–6:15).

We further considered and gave appropriate weight to the Federal Circuit's construction of the phrase "composite image," which agreed with the Board's claim construction of "a composite image." *Id.* at 16–17 (quoting *Vederi*, 813 F. App'x at 503). Notably, the Federal Circuit rejected Vederi's proffered

> narrowing construction that would limit "composite image" to "a new image, created by processing pixel data of a plurality of image frames, that depicts a single new view (from a single location) of the objects in the geographical area that is different from any of the views depicted in any one of the image frames from which the composite image is created."

Vederi, 813 F. App'x at 503; *see also* Dec. 17 (quoting *Vederi*, 813 F. App'x at 503).

We thus disagree that the Board overlooked or misapprehended an argument that the phrase a "composite image" in claims 13, 18, and 23 was construed inconsistent with the '316 patent or its plain and ordinary meaning as an ordinarily skilled artisan would have understood.

B. *"[A]n arbitrary address" in claim 20*

Claim 20 depends from canceled independent claim 1 and recites, in pertinent part, "the first location specified by the first user input is an arbitrary address entered via the first user input . . . ." The '316 patent, 16:62–64. Regarding this recitation, the June 2021 Decision stated "one ordinary meaning of 'arbitrary' includes those based on the user's preference or convenience." Dec. 20. We further "determine[d] 'an arbitrary address entered via the first user input,' as claim 20 recites, can be various addresses, including an assigned address and an address selected from a group associated with tagged images." *Id.* at 21.

Patent Owner contends that the term "arbitrary address" in claim 20 should have its ordinary and customary meaning under *Phillips* and consistent with the Specification. Req. Reh'g 8. Patent Owner argues the ordinary meaning of "'arbitrary address' means 'any potential addresses (assigned and unassigned) in the geographic area, not preselected or constrained by the system.'" *Id.* For support, Patent Owner cites to a dictionary definition and the '316 patent, as well as providing hypothetical examples. *Id.* at 9 n.1 (citing *Arbitrary*, The American Heritage® Dictionary, *available at*

https://www.ahdictionary.com/word/search.html?q=arbitrary (defs. 1 and 2) ("adj. 1. Determined by chance, whim, or impulse, and not by necessity, reason, or principle: *stopped at the first motel we passed, an arbitrary choice*. 2. Based on or subject to individual judgment or preference: *The diet imposes overall calorie limits, but daily menus are arbitrary*")); *see id.* at 9–13 (citing the '316 patent, 2:45–49, 6:37–47, 7:15–20, 11:4–12, 13:21–14:14; Dec. 19–20). Patent Owner also argues that its construction "does not intend to exclude assigned addresses." *Id.* at 20. Patent Owner further asserts "[t]he district court" construed this term "to mean 'assigned and unassigned addresses.'" *Id.* at 8.

Requester determines the Board's construction that "an ordinary understanding of 'arbitrary address' includes an address selected by users based on their preferences or convenience" is correct and confirmed by Patent Owner's definition. 3PR Comments 9 (citing Dec. 20; Req. Reh'g 9 n.1). Requester contends that "Patent Owner raised the same narrow claim construction with the Board, and the Board rejected Patent Owner's proposed construction and related arguments." *Id.* at 8 (citing Aug. 15, 2016 Decision 13–14, 22–23 (vacated)). Requester asserts the '316 patent does not use the phrase "unassigned address" and does not discuss "the address is arbitrary, unassigned, or unconstrained by the system" or "any potential address, unassigned, or 'not preselected' as argued by Patent Owner." *Id.* at 8. Requester states the '316 patent refers to "'an arbitrary address' as including an address selected from a group of addresses." *Id.* (citing the '316 patent 11:45–46, 12:20–26, 12:32–35, 13:21–24.). Requester also states "the '316 patent discusses entering 'an address of the location'—

rather than some random address—and returning a map corresponding to the address." *Id.* (citing the '316 patent 11:45–46). Requester further notes Patent Owner "fails to provide any citation or other support for that proposition" of the district court's adopted construction for "an arbitrary address." *Id.* at 9 (citing Req. Reh'g 8; Aug. 15, 2016 Dec. 14).

Patent Owner repeats many of the arguments made in its Appeal Brief and previously. For example, Patent Owner argues that "an arbitrary address" in claim 20 means "any potential addresses (assigned and unassigned) in the geographic area, not preselected or constrained by the system." Req. Reh'g 8; *see* PO Appeal Br. 21 (arguing the same). The June 2021 Decision considered and addressed this argument. Dec. 19–20; *see also* August 2016 Decision 22–23 (now vacated). Additionally, Patent Owner argued that "the district court" adopted a similar construction. Req. Reh'g 8 (stating the court found "'an arbitrary address' to mean 'assigned and unassigned addresses'"); *see* PO Appeal Br. 21–22 (arguing the same). The June 2021 Decision considered and addressed this argument. Dec. 21 (indicating Patent Owner provided no "supporting evidence" for this assertion). In the Request for Rehearing, Patent Owner does not provide any further evidence of the court's findings. *See* Req. Reh'g 8; *see also* 3PR Comments 9 (noting Patent Owner "fails to provide any citation or other support for that proposition [of the purported court's construction for 'an arbitrary address'].”). As yet a third example, Patent Owner asserts the '316 patent describes entering an address "regardless of whether that address actually exists." Req. Reh'g 10 (citing the '316 patent 13:21–14:14); *see* PO Appeal Br. 23 (arguing the same). The June 2021 Decision considered and

addressed this argument. Dec. 20 (indicating the cited passages do not describe what Patent Owner asserts). As such, we did not overlook these points in entering the new ground of rejection for claim 20 based on Yee, Lachinski, and Dykes.

Patent Owner also repeats that an ordinary meaning of "arbitrary" means "arbitrary *something*" and that this "refers to any member of a set of potential or possible '*somethings*.'" Req. Reh'g 9; *see* PO Appeal Br. 22 (asserting the same). The Board considered this argument in the June 2021 Decision, but found that an ordinary meaning of "arbitrary" includes "those based on the user's preference or convenience" (Dec. 20; *id.* at 20 n.14 (citing *Arbitrary,* Merriam-Webster Online Dictionary, *available at* https://www.merriam-webster.com/dictionary/arbitrary (def. 1b) (defining "arbitrary" as "based on or determined by individual preference or convenience rather than by necessity or the intrinsic nature of something"))) and thus, "an ordinary understanding of 'arbitrary address' includes an address selected by users based on their preferences or conveniences." *Id.* at 20; *see id.* at 20–21.

In the Request for Rehearing, Patent Owner introduces another definition of "arbitrary" to include "1. Determined by chance, whim, or impulse, and not by necessity, reason, or principle: *stopped at the first motel we passed, an arbitrary choice*" and "2. Based on or subject to individual judgment or preference: *The diet imposes overall calorie limits, but daily menus are arbitrary*." Req. Reh'g 9 n.1 (citing *Arbitrary*, The American Heritage® Dictionary, *available at* https://www.ahdictionary.com/word/search.html?q=arbitrary (defs. 1 and

2)). Some of this definition (e.g., "[b]ased on or subject to individual judgment or preference") is similar to that presented in the June 2021 Decision (e.g., "based on the user's preference or convenience" (Dec. 20)). As such, we did not misapprehend the ordinary meaning of "arbitrary" and thus, the ordinary meaning of "arbitrary address" found in claim 20.

Importantly, the June 2021 Decision (as well as the vacated August 2016 Decision) considered various passages in the '316 patent, indicating that the '316 patent "does not discuss arbitrary addresses" (Dec. 19), "does not mention that the address is arbitrary or unassigned by the system" (*id.* at 19; *see id.* at 19–20 (citing the '316 patent 11:45–46)), "does not describe selecting a potential address without one-to-one correspondence" (*id.* at 20 (citing the '316 patent 2:45–49)), and "do not describe a user entering an address 'regardless of whether that address actually exists'" (*id.* (quoting PO Appeal Br. 23) (citing the '316 patent 13:21–14:14)). *See id.* at 19–20 (further citing the '316 patent 7:15–20, 12:20–22, 12:32–35, 13:23, 13:28–29). Patent Owner quotes and discusses these and other passages to support its proposed construction. *See* Req. Reh'g 9–13 (citing the '316 patent 2:45–49, 6:37–47, 7:15–20, 11:4–12, 13:21–14:14). But, most of these passages were considered and support the Board's construction in the June 2021 Decision. *See* Dec. 19–20; *see also* Aug. 2016 Decision 23 (vacated) (citing and considering the '316 patent 11:45–46, 12:20–26, 12:32–35, 13:21–24). These arguments thus were not overlooked. Indeed, as the June 2021 Decision states, the cited passages in the '316 patent merely describe "entering 'an address of the location'—not some random address—and returning a map corresponding to the address." Dec. 20 (citing the '316

patent 11:45–46, 12:20–22, 12:32–35, 13:21–24); *see also* Aug. 2016 Decision 14 (vacated) (stating the same).

We add that the ’316 patent states “the image database contains substantially all of the static objects in the geographic area allowing a user to visually navigate the area from a user terminal” (the ’316 patent 2:45–48) and does not address “the ability to select any potential address within a geographic area,” “the ability to . . . view that address without one-to-one corresponding street images,” or the meaning of “an arbitrary address” contrary to Patent Owner’s contentions. Req. Reh’g 9; *see id.* at 9–10. Moreover, contrary to Patent Owner’s assertions (Req. Reh’g 11–13), the ’316 patent description of (1) segmenting a trajectory of captured images into street segments, (2) associating them with number range (the ’316 patent 6:37–47), and (3) using an offset value to correct computed street numbers (the ’316 patent 11:4–12) do not address what a user *inputs* into its system and in particular, whether the input is “an arbitrary address” as claim 20 recites. Similarly, the ’316 patent discussion of “the desired street number” (*see* the ’316 patent 14:8–14) does not indicate that this number is “an ‘arbitrary address’” as argued. *See* Req. Reh’g 13.

Notably, even the hypothetical presented by Patent Owner (e.g., asserting that an “arbitrary number” is “any number between 1 and 100” to support that “an arbitrary address” includes “each member of the set” (Req. Reh’g 9)) has been previously considered by the Board. *See* Aug. 2016 Decision 23–24 (vacated). Entering or inputting the number “70” of an existing street address, for example, is still one of the possible numbers in

Patent Owner's hypothetical. We thus did not misapprehend the meaning of "an arbitrary address" consistent with the '316 patent.

Lastly, Patent Owner argues that its construction for "arbitrary address" in claim 20 "does not intend to exclude assigned addresses." *Id.* at 20. Yet, when discussing the prior art, Patent Owner argues that Yee fails to teach "an arbitrary address" because "Yee is silent with regard to how the system will react to the entry of street addresses that are not tagged." *Id.* As such, Patent Owner implicitly argues either that "an arbitrary address" is one that is not tagged (e.g., excluding an assigned address) or must encompass *multiple addresses* (e.g., all possible addresses). *See id.* at 9. Neither of these proposed constructions is consistent with an ordinary meaning of an "address" when considering the '316 patent.

In sum, we disagree that the Board overlooked or misapprehended an argument that the phrase "an arbitrary address" in claim 20 was construed inconsistent with the '316 patent or its plain and ordinary meaning as an ordinarily skilled artisan would have been understood. We maintain that "an arbitrary address" can be various addresses, including those based on the user's preference or convenience, and can be an assigned address or an address selected from a group associated with tagged images.

II. *New ground based on Yee, Lachinski, and Dykes*

Background

The June 2021 Decision presented a new ground of rejection for claims 13 and 18–24 under 35 U.S.C. § 103(a) based on Yee, Lachinski, and Dykes. *See* Dec. 22–40. Patent Owner argues claims 13, 18, and 23 as a

group, claim 20 individually, claims 21–24 as a group, and the remaining claims as a group. *See* Req. Reh'g 13–23. We address each of these groupings below.

A. Claims 13, 18, and 23

As previously discussed, claims 13, 18, and 24 recite "a composite image." The '316 patent 16:37–38, 16:56–57, 17:14–15. Each claim thus includes the discussed "composite image" addressed above in Section I.A. The June 2021 Decision determined that Yee, Lachinski, and Dykes teach this recitation found in claims 13, 18, and 23. Dec. 24–31.

Patent Owner argues that Yee alone or Yee and Dykes in combination do not disclose the recited "composite image." Req. Reh'g 13–17. Patent Owner specifically argues that "Yee does not clearly disclose 'composite images' in accordance with the proper construction . . . under the *Phillips* standard." *Id.* at 14.[11] We disagree.

As stated in the June 2021 Decision,

> Yee addresses collected data made available with its product. Yee 389. The data includes provided various views, including "curbside view, front and back," "street view, front and back," "real estate view left and right," "real estate and addresss [sic] zoom, 4-view," *and* "composites of them." *Id.* Yee explicitly discloses "composites" (*id.*); and "them" refers back to the other discussed views, including a curbside view, a street view,

[11] As addressed in Section I.A, we determined that the phrase "composite image" consistent with the '316 patent and its plain and ordinary meaning is "a single image created by combining different image data or by uniting image data" and that "a single image" does not have to be a new image that depicts a single new view from a single location that is different from any of the views.

> and a real estate view. Thus, Yee teaches creating "composites" of these various views.

Dec. 25–26; *see also* 3PR Comments 4 (stating "Yee explicitly used the term 'composite' in its disclosure."); *id.* at 4–5 (quoting Yee 389).

Regarding the GeoSpan Brochure[12] (Req. Reh'g 14–15), Patent Owner asserts the brochure's "composite view" "clarifies the meaning of 'composite of them' as the term was used in Yee and rebuts the characterization of Yee as allegedly disclosing a 'composite image' as the term" should be construed. Req. Reh'g 15; *see id.* (reproducing the image in the GeoSpan Brochure on GEO_0000173). Patent Owner further asserts "there is no other evidence cited from the record associated with [the] Yee reference (e.g., related to the work by the GeoSpan Corporation) that uses the word 'composite' or variants thereof." *Id.* at 15; *see also id.* at 16. Patent Owner further asserts that the GeoSpan Brochure's "composite view," and thus, Yee's "composite of them" (Yee 389) "shows four images," not "a single image." *Id.* at 16.

The reproduced image in the Request for Rehearing (Req. Reh'g 15) is described as a "*4-way* Composite View" (*id.* (emphasis added)), whereas Yee describes the "4-view" as a separate view from the "composite of them." Yee 389; *see also* Dec. 26 (stating "the language 'composite of them' in Yee is *separate* from the '4-view'") (citing Yee 389); 3PR Comments 5 (noting the same). Also, although "GeoVista" and "GeoSpan"

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[12] DRIVE AROUND TOWN ON YOUR PC WITH GEOVISTA, VISUAL GEOGRAPHIC INFORMATION, GEO_0000172–177 (Exhibit A) ("the GeoSpan Brochure"). Patent Owner assert this reference was included in its January 8, 2013 Reply "as Appx1332." Req. Reh'g 14.

are discussed in Yee (*see, e.g.,* Yee 388, 392), there is insufficient evidence that the "4-way" view in the GeoSpan Brochure demonstrates the only possible 4-view that Yee creates. *See* Dec. 27 (noting "the described GeoSpan Brochure is just one image example of data acquired by GeoSpan Corporation discussed in Yee"); *see* 3PR Comments 5 (noting the same).

Also, despite Lachinski[13] failing to use the word "composite" (Req. Reh'g 14), the Board found that Lachinski provides insight as to what Yee's "4-view" may encompass. First, Lachinski is a patent issued to GeoSpan Corporation on May 27, 1997. Second, "GeoSpan" and a "4-view" are discussed in Yee. *See* Yee 388–89. Third, the June 2021 Decision indicates there are similarities between Yee and Lachinski. *See* Dec. 27–28 (citing Yee 392; Lachinski 5:25–31, Fig. 3). As stated, Lachinski's teaching:

> supports that the "4-view" discussed in Yee (Yee 389) is produced as *a single image* that combines four reduced images, one in each of four comers that is reduced in size. Lachinski 5:25-31; Fig. 3.
>
> . . .
>
> Moreover, Yee teaches that data from the four images, which include their pixel data, are used to create the reduced-sized images. Each of the "four views in a frame" discussed in Yee (Yee 392) or the "*single video image*" with four-views, each one-fourth of its original size that form "reduced images," as further explained in Lachinski (Lachinski 5:25-31), *is a single image* that is made up of different parts or image frames (e.g., image data from multiple views) . . . .

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[13] Lachinski was previously introduced into the record and was permitted under § 1.948(a)(2). *See* 3PR Appeal Br. 11 n.1.

Dec. 28 (emphases added); *see also* 3PR Comments 5 (stating "[a]nother example of a 4-view of Yee, as further explained in Lachinski,[] includes a *single* image made out of four reduced size images") (omitting footnote) (citing Yee 392; Lachinski 5:25-31, Fig. 3)).

Lastly, Patent Owner's arguments (Req. Reh'g 13–17) overlook the June 2021 Decision's further discussion of Dykes teachings in this regard. The June 2021 Decision additionally states:

> Yee is not deficient in teaching "a composite image" as claims 13, 18, and 23 recite. Nonetheless, presuming, without agreeing, that Yee and Lachinski do not teach the recited "composite image," Dykes teaches another known technique for creating "composites" by combining and uniting images (e.g., stitching) to produce a panoramic image. Dykes 132–36, Fig. 2. When substituting one known element for another known in the art (e.g., [substituting] Yee's composite technique for Dykes' panoramic technique of forming a composite), "the combination must do more than yield a predictable result." *KSR Int'l Co. v. Teleflex Inc.,* 550 U.S. 398, 416 (2007).

Dec. 30–31; *see also id.* at 24 (adopting the Requester's findings and conclusions, which discuss both Yee and Dykes). The new ground of rejection therefore relies on *both* Yee and Dykes's teachings collectively to arrive at the claimed "composite image" found in the claims.

Accordingly, we are not persuaded that the rejection fails to demonstrate that Yee, Lachinski, and Dykes teach or suggest "a composite image" as recited in claims 13, 18, and 23, such that the Board misapprehended or overlooked any point in the newly presented ground.

B. *Reason with rational underpinning for combining Yee and Dykes*

Patent Owner "submits that it is unclear why one of skill in the art would have combined the cited Yee and Dykes . . . to arrive at 'composite image' as properly construed under the *Phillips* standard." Req. Reh'g 17; *see id.* at 17–19 (quoting Dec. 40[14]; Dykes 135) (reproducing Dykes, Fig. 2). Patent Owner argues that (1) Dykes requires that there be a "small overlap" between images, (2) Yee does not disclose the "small overlap" feature allegedly required by Dykes, and (3) it is not clear how Yee would be suitable for Dykes's stitching feature. *Id.* at 19.

We are not persuaded. As the Court states, "when a patent claims a structure already known in the prior art that is altered by the mere substitution of one element for another known in the field, the combination must do more than yield a predictable result." *KSR Int'l Co. v. Teleflex Inc.*, 550 U.S. 398, 417 (2007). As proposed (*see* Dec. 24, 29–30), combining Yee and Dykes to arrive at a "composite image" (e.g., a panoramic image) is no more than the simple substitution of one known element (e.g., Yee's "composites of them" (Yee 389)) for another (e.g., Dykes's composite image arrived at by stitching images together (Dykes 132–36, Fig. 2)) or "the mere application of a known technique to a piece of prior art ready for the improvement." *KSR*, 550 U.S. at 417; *see also* Dec. 29–30.

Moreover, Patent Owner does not demonstrate adequately that the proposed combination would not yield the predictable result of "a composite image" as claims 13, 18, and 23 recite. *See* Req. Reh'g 17–19. As Requester indicates (*see* 3PR Comments 6–7), Yee captures many images,

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[14] The quoted passage on page 40 was not located.

which would encompass the coverage needed to create Dykes's panoramic images. *See id.* at 7 (citing Yee 391) (noting Yee teaches 10 cameras capturing 63-degree horizontal, angled views). We agree with Requester that Yee teaches or at least suggests to an ordinarily skilled artisan that some of its images would contain the overlap discussed in Dykes's stitching techniques (*see* Dykes 135) as evidenced by (1) the front, back, left, right, curbside, street, real estate, and address views (*see* Yee 389, 391) and (2) collecting data "looking <u>globally</u>" and "<u>comprehensively</u>" to "ensure[] no object is lost behind an obstruction" (*id.* at 390).

For the reasons discussed above, we are not persuaded that the rejection fails to provide a reason with a rational underpinning to combine Yee and Dykes to arrive at the claims at issue, such that the Board misapprehended or overlooked a point in the newly presented ground.

C. "[A]n arbitrary address" in claims 20

Claim 20 depends from claim 1 and further recites in relevant part, "the first location specified by the first user input is an arbitrary address entered via the first user input . . . ." The '316 patent, 16:62–64. The June 2021 Decision found this recitation was taught by Yee and Lachinski. *See* Dec. 32–36 (citing Yee 391–92; Lachinski 16:63–66, 17:15–21).

Patent Owner argues that "Yee is silent with regard to how the system will react to the entry of street addresses that are not tagged, and therefore this portion of Yee does not appear to disclose an 'arbitrary address.'" Req. Reh'g 20 (citing Dec, 35; Yee 392). Patent Owner also asserts pointing to a road segment or a location on a map does not specify "an arbitrary address." *Id.* (citing Dec. 35; Yee 391–92). Patent Owner further contends Lachinski

does not disclose entering an arbitrary address but rather only that an address can be parsed, and it is unclear to an ordinarily skilled artisan if the disclosed address parsing in Lachinski "may refer to other operations for converting the user entry into a 'standard address.'" *Id.* at 21; *see also id.* at 20–21 (citing Dec. 36; Lachinski 16:33–35, 16:63–66).

Requester disagrees. 3PR Comments 9–11.

Based on our construction of "an arbitrary address" in Section I.B, "an arbitrary address" includes an address based on the user's preference or convenience and can be include an assigned address or an address selected from a group associated with tagged images. As such, Yee's Visual Interface System (VIS), which retrieves images based on a user entering a street address or selecting a road segment or specific location on a map (e.g., entered or selected based on the user's preference or convenience) (*see* Yee 391–92), teaches and suggests "the first location specified by the first user input is an arbitrary address entered via the first user input" as claim 20 recites. *See* Dec. 34–35 (citing and discussing Yee 391–92). Moreover, even under Patent Owner's proposed interpretation, Yee discloses "[a] user can point at a road segment or specific location on a computerized map" (Yee 391) and thus, include an address determined by whim or impulse or "the first location specified by the first user input is an arbitrary address" as claim 20 recites. *See also* 3PR Comments 10 (nothing the same).

Also, Lachinski teaches "a user supplied address" is converted to a standard address for matching to "a real address range" (Lachinski 16:63–66), "[a] video image can be recalled" (*id.* at 17:15), and the process of "retrieval of the nearest video image to a coordinate pair" "*rel[ies] on the*

segment-video relationship discussed above" (*id.* at 17:18–20 (emphasis added)). *See also* 3PR Comments 10 (citing the '316 patent 17:19–20); *cf.* the '316 patent 14:15–20, 14:57–65. Thus, Lachinski also teaches a user entering a chosen address. Yet, the rejection further discusses applying Lachinski's teachings to Yee, such that the combination would predictably yield no more than permitting a user to enter an address near or close to an address in a system (e.g., another form of a "first location specified by the first user input is an arbitrary address") and retrieving an image associated with the location. *See* Dec. 36. We thus disagree with Patent Owner that one skilled in the art would not have recognized that Lachinski's teachings in this regard refer to operations other than converting the user's entry into a standard address as asserted.

For the reasons discussed above, we are not persuaded that Yee or the Yee/Lachinski combination fail to teach or suggest the recited "arbitrary address" in claim 20 or that an ordinary skilled artisan would not have combined Lachinski's teachings with Yee as the rejection explains, such that the Board misapprehended or overlooked any point in the newly presented ground.

D. Claims 21–24

Claim 21 depends from claim 20 and further recites additional limitations. The '316 patent, 16:67–17:9. Claims 22–23 ultimately depend from claim 21 and are not separately argued. Req. Reh'g 21–23. We select claim 21 as representative. *See* 37 C.F.R. § 41.37(c)(1)(iv).

Patent Owner repeats that Yee and Lachinski do not disclose the recited "arbitrary address" and thus fail to teach claim 21. Req. Reh'g 22. We are not persuaded for the reasons previously stated.

Patent Owner next argues Yee and Lachinski do not disclose all the recitations in claim 21. Req. Reh'g 21–22. However, Patent Owner only discusses the specific step of "identifying one of the plurality of street segments based on the arbitrary address" in claim 21. *See id.* at 22–23. Thus, for the other recitation in claim 21, Patent Owner's mere assertion Yee and Lachinski do not teach the features of claim 21 by reciting the claim features (*see id.* at 21) is not considered a separate argument for patentability. *See In re Lovin*, 652 F.3d 1349, 1357 (Fed. Cir. 2011).

As for the disputed "identifying one of the plurality of street segments based on the arbitrary address" in claim 21, Patent Owner argues Yee does not teach this limitation because Yee directly selects a road segment by pointing and thus does not need to identify the street segment based on the arbitrary address. Req. Reh'g 22. As for Lachinski, Patent Owner argues the reference only addresses creating "associations between the recorded videos and road segments" and not identifying road segments based on the user input. *Id.* (citing Lachinski 13:60–63).

Requester disagrees. 3PR Comments 11–12. In particular, Requester states the Federal Circuit considered whether Dykes and Yee teach "street segments" as required by some claims and determine there was substantial evidence to support the Board's findings. *Id.* at 11 (quoting *Vederi*, 813 F. App'x at 505). Requester also contends Lachinski is not limited to

associating videos and road segments but rather retrieves the nearest video image to a user's selected position. *Id.* at 12 (quoting Lachinski, 14:56–63).

As discussed above when addressing Yee and Lachinski in context of claim 20, Yee's teaches a system that retrieves images based on a user entering a street address or selecting a road segment or specific location on a map (e.g., entered or selected based on the user's preference or convenience). *See* Yee 391–92. An ordinarily skilled artisan would have recognized from this teaching that the system must include processing the selected road segment in Yee's map in order to *identify*, retrieve, and display the selected road segment based on the selection. As such, Yee teaches and suggests "identifying one of the plurality of street segments based on the arbitrary address" as claim 21 recites. Additionally, as discussed above, Lachinski teaches that retrieving "the nearest video image to a coordinate pair" "rel[ies] on the segment-video relationship discussed above." Lachinski 17:18–20. *Cf.* the '316 patent 14:15–20, 14:58–68 (addressing selecting a particular location on a map and displaying the new location based on the selection by determining the image "closest to the distance of the input location from the origin."); *see also* 3PR Comments 12 (quoting the '316 patent 14:56–63). Lachinski in combination with Yee thus also suggests to an ordinary skilled artisan "identifying one of the plurality of street segments based on the arbitrary address" as claim 21 recites.

Lastly, when addressing "'street segments' as required by some of the claims," the Federal Circuit held that "substantial evidence supports the Board's finding that the prior art discloses the disputed claim limitations." *Vederi*, 813 F. App'x at 505. To the extent this holding related to "street

segments" includes the recited "identifying one of the plurality of street segments based on the arbitrary address" in claim 21, this determination provides further evidence that the prior art teaches and suggests what is recited in claim 21.

For the reasons discussed above, we are not persuaded that Yee, Lachinski, and Dykes combination fail to teach or suggest the recited "identifying one of the plurality of street segments based on the arbitrary address" in claim 21, such that the Board misapprehended or overlooked any point in the newly presented ground.

E. The remaining claim

Other than referencing the previous arguments made for canceled independent claim 18, Patent Owner does not separately argue dependent claim 19. *See generally* Req. Reh'g. We are not persuaded for the reasons previously discussed.

Conclusion

For the foregoing reasons, Patent Owner has not shown any points that the earlier panel misapprehended or overlooked in entering the new ground of claims 13 and 18–24 under 35 U.S.C. § 103(a) based on Yee, Lachinski, and Dykes.

CONCLUSION

We have granted the Request for Rehearing to the extent that we have reconsidered the June 2021 Decision in light of Patent Owner's Request for Rehearing, but have denied the Request for Rehearing in all other respects.

Outcome of Decision on Rehearing:

Claims	35 U.S.C §	Reference(s)/Basis	Denied	Granted
13, 18–24	103(a)	Yee, Lachinski, Dykes	13, 18–24	
Overall Outcome			13, 18–24	

Final Outcome of Appeal after Rehearing:

Claims	35 U.S.C. §	Reference(s)/Basis	Affirmed	Reversed	New Ground
13	102(a)	Dykes		13	
13	102(a)	Al-Kodmany		13	
13	102(a)	Bates		13	
13, 18–24	103(a)	Yee, Dykes		13, 18–24	
13, 18–24	103(a)	Murphy, Yee		13, 18–24	
13, 18–24	103(a)	Shiffer, Yee		13, 18–24	
13, 18–24	103(a)	Yee, Lachinski, Dykes			13, 18–24
Overall Outcome				13, 18–24	13, 18–24

Requests for extensions of time in this *inter partes* reexamination proceeding are governed by 37 C.F.R. § 1.956. *See* Manual of Patent Examining Procedure (MPEP) § 2665; *see also* 37 C.F.R. § 41.79.

DENIED

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The time period for reply, if any, is set in the attached communication.

PTOL-90A (Rev. 04/07)

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

GOOGLE INC.
Requester,

v.

Patent of VEDERI, LLC.
Patent Owner.

Appeal 2018-007745
Reexamination Control 95/000,684
Patent 7,813,596 B2
Technology Center 3900

Before JOHN A. JEFFERY, DENISE M. POTHIER, and ERIC B. CHEN, *Administrative Patent Judges*.

POTHIER, *Administrative Patent Judge*.

DECISION ON REQUEST FOR REHEARING

STATEMENT OF THE CASE

This proceedings involve U.S. Patent No. 7,813,596 B2 ("the '596 patent), which expired on January 11, 2021. Dec. 2.[1] This proceeding is also related to Reexamination Control Nos. 95/000,681–95/000,683, involving U.S. Patent Nos. 7,805,025 B2, 7,239,760 B2, and 7,577,316 B2 respectively, all of which have also expired.

As previously explained (*see* Dec. 1), this proceeding returns to the Board on remand from the Court of Appeals for the Federal Circuit, which vacated previous Board decisions for this proceeding mailed August 15, 2016, September 28, 2018, and February 1, 2019. *See id.*; *see also Vederi, LLC v. Google LLC*, 813 F. App'x 499, 501, 505 (Fed. Cir. 2020). On remand, another panel[2] rendered a Decision on Appeal ("the June 2021 Decision") on June 1, 2021, (1) reversing the rejections of claims 4 and 21

[1] Throughout this Opinion, we refer to: (1) the Request for *Inter Partes* Reexamination ("Request") filed August 17, 2012, (2) the Right of Appeal Notice (RAN) mailed June 4, 2014, (3) the Patent Owner's Appeal Brief (PO Appeal Br.) filed September 3, 2014, (4) the Board's Decision mailed June 1, 2021 ("Dec."), (5) Patent Owner's Request for Rehearing ("Req. Reh'g") filed July 1, 2021, and (6) Requester's Comments in Opposition to Patent Owner's Request for Rehearing ("3PR Comments") filed August 2, 2021.
[2] The panel included Judges Pothier, Chen, and Branch.

based on at least one of Dykes,[3] Yee,[4] Al-Kodmany,[5] Bates,[6] Murphy,[7] Shiffer,[8] and Ishida[9] under 35 U.S.C. §§ 102(a), 102(b), or 103(a) and (2) entering new grounds of rejection under 37 C.F.R. § 41.77(b) for (a) claim 4 based on Yee, Dykes, and Lachinski[10] under 35 U.S.C. § 103(a) and (b) claims 4 and 21 based on Ishida, Yee, and Dykes under 35 U.S.C. § 103(a). Dec. 3, 7–8, 19–38.

In response to the new grounds, Patent Owner requested rehearing under 37 C.F.R. § 41.79 ("Request for Rehearing") on July 1, 2021. Requester responded with comments pursuant to 37 C.F.R. § 41.79(c) ("3PR Comments") on August 2, 2021.

---

[3] J. Dykes, *An Approach To Virtual Environments For Visualization Using Linked Geo-referenced Panoramic Imagery*, 24 Computers, Env't & Urb. Sys. 127–52 (2000) ("Dykes").
[4] Frank Yee, *GPS & Video Data Collection In Los Angeles County: A Status Report, Position Location And Navigation Symposium*, Proc. IEEE Position Location and Navigation 388–93 (1994) ("Yee").
[5] Kheir Al-Kodmany, *Using Web-Based Technologies and Geographic Information Systems in Community Planning*, 7 J. Urb. Tech. 1–31 (2000) ("Al-Kodmany").
[6] Nada Bates-Brkljac & John Counsell, *Issues in Participative Use of an Historic City Millennial Web Site*, IEEE Proc. Int'l Conf. Info. Visualization 119–25 (July 2000) ("Bates").
[7] US 6,282,362 B1, issued Aug. 28, 2001.
[8] Michael J. Shiffer, *Augmenting Geographic Information with Collaborative Multimedia Technologies*, 11 Proc. Auto Carto. 367–76 (1993) ("Shiffer").
[9] Toru Ishida et al., *Digital City Kyoto: Towards A Social Information Infrastructure*, 1652 Lecture Notes in Artificial Int. from Int'l Workshop on Cooperative Inf. Agents 23–35 (1999) ("Ishida").
[10] US 5,633,946, issued on May 27, 1997.

We have reconsidered the June 2021 Decision in light of Patent Owner's contentions in the Request for Rehearing. Patent Owner sets forth reasons why the earlier panel allegedly misapprehended or overlooked points in entering the new grounds of rejection. As discussed below, we maintain the determinations made in the June 2021 Decision.

DISCUSSION

"The request for rehearing must address any new ground of rejection and state with particularity the points believed to have been misapprehended or overlooked in entering the new ground of rejection and also state all other grounds upon which rehearing is sought." 37 C.F.R. § 41.77(b)(2) (2020); *see also* 37 C.F.R. § 41.79(b)(1) (2020).

Patent Owner argues that the June 2021 Decision does not construe several terms in the claims of the '596 patent under their ordinary and customary meanings. Req. Reh'g 2. These terms include "a composite image" in claim 4 (*id.* at 2–8) and "accessing a web page for the retail establishment; and invoking by the computer system a display of the web page on the display screen" ("the Web Page Limitations") in claim 21 (*id.* at 8–10, 17). Patent Owner also asserts that Yee alone or Yee, Dykes, and Lachinski do not disclose a "composite image" in claim 4. *Id.* at 10–16. Regarding the combination of Ishida, Yee, and Dykes, Patent Owner argues Ishida does not teach (1) "a composite image" (*id.* at 16) or (2) the Web Page Limitations in claim 21 because Ishida does not disclose displaying information as a web page (*id.* at 17–19).

Requester disagrees. *See generally* 3PR Comments 1–11.

We address each of Patent Owner's contentions below.

ANALYSIS

I. *Claim construction*

A. *"[A] composite image" in claim 4*

Claim 4 depends from canceled independent claim 1.[11] The phrase "a composite image" is found in claim 4. The '596 patent 16:7. In the June 2021 Decision, the Board found this phrase in claim 4 means "a single image created by combining different image data or [by] uniting image data . . . ." Dec. 17.

Patent Owner asserts that the phrase "composite image," as defined in the June 2021 Decision, is "unclear" because "it does not define what is meant by 'single image.'" Req. Reh'g 3–4. Patent Owner argues that "single image," consistent with the '596 patent's Specification, "would be understood to refer to a single image that is created by uniting those multiple image frames into a single image." *Id.* at 4. Patent Owner also argues that "a composite image" "[a]s used in the Vederi patents" (1) "depicts a single new view of the objects in the geographical area" (*id.* (citing the '596 patent, 5:54–61, 9:10–21)), (2) "[t]he single new view is different from any of the views depicted in any one of the individual image frames prior to forming the composite image" (*id.* (citing the '596 patent 2:37–39, 5:47–51)), and (3) "would not encompass a collage of disparate images," including "a two-by-two grid of views of four different participants on a video conference" (*id.* at

[11] As explained in the June 2021 Decision, independent claims 1 and 15 have been canceled. *See* Dec. 3.

8). For support, Patent Owner quotes and cites to various passages of the ’596 patent. *See id.* at 4–7 (quoting the ’596 patent, 1:27–57, 2:10–12, 2:19–20, 2:33–39, 3:46–49, 5:45–51) (citing the ’596 patent, Abstract, 3:54–57, 5:45–6:5) (reproducing the ’596 patent, Fig. 16; Provisional Application No. 60/238,490, Fig. 11). Patent Owner concludes that "‘composite image’" under the *Phillips*[12] standard" and consistent with the ’596 patent, "refers to a single image created by combining different image data or by uniting image data[,] where the single image provides a single view." *Id.* at 8.

Requester asserts Patent Owner’s arguments were previously rejected by the Board and the Federal Circuit. *See* 3PR Comments 2–4 (citing *Vederi*, 813 F. App’x at 503; Dec. 15; the ’596 patent 5:66–6:1). Additionally, Requester asserts Patent Owner is attempting to limit the phrase "composite image" "to cover only narrow preferred embodiments in the specification." *Id.* at 4 (citing Dec. 16).

The Board gave the claim recitations in the ’596 patent "‘their ordinary and customary meaning’ as would have been understood by ‘a person of ordinary skill in the art in question at the time of the invention.’" Dec. 8 (quoting *Phillips*, 415 F.3d at 1312–13); *see id.* at 15 nn.11–13 (addressing the term "composite") (citing Merriam-Webster’s Online Dictionary (11th ed.)). Additionally, the Board panel stated "[c]laims ‘must be read in view of the specification, of which they are a part’" and that "the specification ‘is always highly relevant to the claim construction analysis.’" *Id.* at 8–9 (quoting *Phillips*, 415 F.3d at 1315 (citations omitted)). Consistent with these principles, the Board has considered how the

[12] *Phillips v. AWH Corp.*, 415 F.3d 1303 (Fed. Cir. 2005).

Specification describes "a composite image" in arriving at the current claim construction. *See id.* at 14–16 (citing the '596 patent, Abstract, 2:22–24, 2:34–36, 3:46–49, 5:45–47, 5:66–6:1, Fig. 2).

The Board further considered and gave appropriate weight to the Federal Circuit's construction of the phrase "composite image," which agreed with the Board's claim construction of "a composite image." Dec. 15–16 (quoting *Vederi*, 813 F. App'x at 503). Notably, the Federal Circuit rejected Vederi's proffered

> narrowing construction that would limit "composite image" to "a new image, created by processing pixel data of a plurality of image frames, that depicts a single new view (from a single location) of the objects in the geographical area that is different from any of the views depicted in any one of the image frames from which the composite image is created."

Vederi, 813 F. App'x at 503; *see also* the June 2021 Decision 15–16 (quoting *Vederi*, 813 F. App'x at 503).

We thus disagree that the Board overlooked or misapprehended an argument that the phrase "a composite image" in claim 4 was construed inconsistent with the '596 patent or its plain and ordinary meaning as an ordinarily skilled artisan would have understood.

B. *"[A] web page for the retail establishment" in claim 21*

Claim 21 ultimately depends from canceled independent claim 15 and recites, in pertinent part, "accessing a web page for the retail establishment; and invoking by the computer system a display of the web page on the display screen." The '596 patent, 18:10–12. Regarding the recitation "web page for the retail establishment," the June 2021 Decision states "we understand the ordinary meaning of this phrase to include a web page that

(1) shows particular information about the retail establishment or (2) is associated with a particular retail establishment." Dec. 18.

Patent Owner contends that the June 2021 "Decision does not appear to provide a construction for the term 'web page' in accordance with the ordinary meaning of the phrase." Req. Reh'g 9. Patent Owner

> submits that a person of ordinary skill in the art at the time of the invention would understand that a Web page is a hypertext document written in the Hypertext Markup Language (HTML), which may further include images, video, and/or client-side scripts (e.g., VBScript or JavaScript)[], and a Web browser renders a Web page to be displayed to a user.

Id. at 10; *see id.* n.1 (citing *Web page*, The American Heritage® Dictionary of the English Language ("n. A document on the World Wide Web, consisting of a hypertext file and any related files for scripts and graphics, and often hyperlinked to other documents on the Web"), 17 (same); *id.* at 9–10 (citing the '025 patent 12:53–56, Fig. 16[13]) (omitting footnote).

Requester contends that the Federal Circuit found "for this exact term[,] that . . . '[t]he specification does nothing to limit [the] broad claim language' at issue." 3PR Comments 8 (quoting *Vederi*, 813 F. App'x at 504).[14] Requester asserts that Patent Owner does "[n]ot heed[] the Federal Circuit's caution" and instead attempts to narrow the claim construction of the "web page" to include "a 'web browser' limitation," which is not supported by the dictionary definition presented by Patent Owner and is only described as a preferred feature in the '596 patent's Specification. *Id.* at 8–9

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[13] Column 12, lines 53–56 and Figure 16 of the '596 patent are similar to U.S. 7,805,025 B2 ("the '025 patent"). *See* 3PR Comments 9 n.4.
[14] The quotation is found at *Vederi*, 813 F. App'x at 505.

(citing Req. Reh'g 10 n.1; *Web page*, The American Heritage® Dictionary of the English Language; the '596 patent 12:53–56).

We did not construe the phrase "web page" explicitly in the June 2021 Decision. We did consider the '596 patent cited by Patent Owner in addressing what "a web page for the retail establishment" would encompass—"a web page that (1) shows particular information about the retail establishment or (2) is associated with a particular retail establishment." Dec. 18 (discussing the '596 patent 12:48, 12:53–54). Furthermore, as the Federal Circuit found, "[t]he specification does nothing to limit this broad claim language" of "accessing a web page for the retail establishment" as claim 21 recites. *Vederi*, 813 F. App'x at 505. As such, contrary to Patent Owner's assertions (*see* Req. Reh'g 10), the Specification does not define or limit the phrase "web page" found in claim 21 to include a web browser for rendering and displaying the web page. Indeed, the definition of "web page" provided by Patent Owner—"[a] document on the World Wide Web, consisting of a hypertext file and any related files for scripts and graphics, and often hyperlinked to other documents on the Web" (*Web page*, The American Heritage® Dictionary of the English Language, *available at* https://www.ahdictionary.com/word/search.html?q=web+page)—does not require a rendered web page to be displayed using a web browser as Patent Owner argues.

Additionally, although the Specification's column 12 describes an embodiment that "preferably" displays a web page "on a separate browser window" (the '596 patent 12:55–56), we decline to import this specific embodiment into claim 21, which only recites "invoking . . . a display of the

web page on the display screen" without limiting this invocation to using a web browser. *Id.* at 18:11–12; *see also Phillips*, 415 F.3d at 1323 ("[A]lthough the specification often describes very specific embodiments of the invention, [the Federal Circuit] ha[s] repeatedly warned against confining the claims to those embodiments."), *quoted in* Dec. 16.

That said, Patent Owner has provided a definition of "a web page," which is "[a] document on the World Wide Web, consisting of a hypertext file and any related files for scripts and graphics" as an ordinary meaning of this term. *Web page*, The American Heritage® Dictionary of the English Language, *cited in* Req. Reh'g 10. Other than disputing the "unduly narrow construction requiring a 'web browser'[,]" Requester has not challenged this proposed ordinary meaning of "web page." *See* 3PR Comments 8–9. On the record, we find this definition is one plain meaning of the phrase "web page." The remainder of the "web page" definition, however, states the document is "*often* hyperlinked to other documents on the Web" (*Web page*, The American Heritage® Dictionary of the English Language (emphasis added)), and thus, this hyperlinked feature is not required to be "a web page" as claim 21 recites.

We thus disagree that the Board overlooked or misapprehended an argument that the phrase "a web page" in claim 21 was construed inconsistent with the '596 patent or its plain and ordinary meaning as an ordinarily skilled artisan would have understood it. We further determine "a web page" includes a document on the World Wide Web, consisting of a hypertext file and any related files for scripts and graphics.

II. *New grounds based on prior art*

A. *Yee, Lachinski, and Dykes*

The June 2021 Decision presented a new ground of rejection for claim 4 under 35 U.S.C. § 103(a) based on Yee, Lachinski, and Dykes. *See* Dec. 19–27.

1. *"[A] composite image"*

Patent Owner argues that Yee does not disclose "a composite image" in claim 4 "under the proper construction of the term under the *Phillips* standard" consistent with the '596 patent. Req. Reh'g 10; *see id.* at 10–14. Patent Owner contends Yee fails to provide examples of "composites of them" and Lachinski does not use the word "composite." *Id.* at 11. Patent Owner also argues that the GeoSpan Brochure[15] "provides a clear example of a 'composite view' as the term was used by GeoSpan, which is the system described by Yee" and "clarifies the meaning of 'composites of them' as the term was used in Yee . . . ." *Id.* at 12 (reproducing the image in the GeoSpan Brochure on GEO_0000173). Patent Owner contends "there is no other evidence cited from the record associated with [the] Yee reference (e.g., related to the work by the GeoSpan Corporation) that uses the word 'composite' or variants thereof." *Id.*; *see id.* at 12–13 (citing Yee 389; Dec. 25). Patent Owner argues the GeoSpan Brochure's figure "show[s] four images," and it "would be . . . uncustomary" (*id.* at 13) to an ordinarily

[15] DRIVE AROUND TOWN ON YOUR PC WITH GEOVISTA, VISUAL GEOGRAPHIC INFORMATION, GEO_0000172–177 ("the GeoSpan Brochure'). Patent Owner asserts this reference was included in its January 8, 2013 Reply "as Appx1332." Req. Reh'g 11. Patent Owner also indicates this reference is attached as Exhibit A. *Id.* at 12.

skilled artisan to consider this figure as "a single image" (*id.* at 14).

As addressed in Section I.A, we determined that the phrase "composite image" consistent with the '596 patent and its plain and ordinary meaning is "a single image created by combining different image data or [by] uniting image data" (Dec. 17), and that "a single image" does not have to be a new image that depicts a single new view from a single location that is different from any of the views (*see id.* at 15–16).

Additionally, contrary to Patent Owner's assertion, Yee provides some evidence of what its composites will be. As stated in the June 2021 Decision,

> Yee actually discloses "composites." That is, Yee states "[s]ome of the specific data to be collected and made available . . . include: curbside view, front and back; street view, front and back; real estate view left and right; real estate and addresss [sic] zoom, 4-view; and *composites of them*." Yee 389 (emphasis added). *This portion of Yee explicitly discloses a composite image* (i.e., "composite of them"). *Id.* Notably, the language "composites of them" in Yee is separate from the other described views, including the 4-view, and *"them" refers back to the other discussed views, including a curbside view, a street view, and a real estate view.*

Dec. 22 (latter two emphases added); *see also* Yee 389; 3PR Comments 4–6 (noting Yee explicitly used the term "composite" and provides that the composite can be of any of the above-described views) (citing Dec. 22–24).

Regarding the GeoSpan Brochure, we are not persuaded that this demonstrates Yee's "composites of them" are only four images rather than a single image. *See* Req. Reh'g 13–14. Although "GeoVista" and "GeoSpan" are discussed in Yee (*see, e.g.*, Yee 388, 392), there is insufficient evidence

that the "4-way" view in the GeoSpan Brochure demonstrates the only possible 4-view that Yee creates. *See* Dec. 24–25 (stating "Patent Owner presumes the example from 'the GeoSpan Brochure'[] (PO Appeal Br. 22 n.2) is the only '4-view' that Yee envisions") (footnote omitted). Also, the reproduced image in the Request for Rehearing (Req. Reh'g 12) is described as a "*4-way* Composite View" (*id.* (emphasis added)), whereas Yee describes the "4-view" as a separate view from the "composite of them" and other views. Yee 389; *see also* Dec. 22 (stating "the language 'composites of them' in Yee is *separate* from the other described views, including the 4-view") (emphasis added).

Furthermore, regardless of whether Lachinski uses the word "composite" (Req. Reh'g 11), we find that Lachinski provides insight as to what Yee's "4-view" may be. Specifically, the June 2021 Decision determined:

> Yee discusses a "4-view" example but does not provide details concerning how the view is formed. *See* [Yee] 389. Lachinski, which is a patent assigned to GeoSpan Corporation (Lachinski, code (73)), explains:
>
>> The four-view generator 62 has four inputs 82, allowing signals from four of the video cameras 50 to be input simultaneously. The generator 62 reduces the image represented by each signal to one-fourth of its original size and then *combines the reduced images to form a single video image* by placing each of the reduced images into one of the four corners of an output image.
>
> *Id.* at 5:25–31 (emphasis added), Fig. 3. Thus, *the 4-view discussed in Yee (Yee 389) can be produced as a single image that combines four reduced images* (e.g., different image data at the pixel data level), one in each of four corners that is reduced in size as taught by Lachinski's known technique.

> . . . [E]ach of the “four views in a frame” discussed in Yee (Yee 392) or the “single video image” with four reduced views (e.g., one-fourth of its original size that form “reduced images” as explained in Lachinski (Lachinski 5:25–31)) is a single image that is made up of different parts or image frames (e.g., image data from multiple views) and combines pixel image data from each of the different view image frames collectively to create the *single* 4-view image. Yee, as evidenced by Lachinski, therefore teaches and suggests another example of “a composite image” as claim 4 recites.

Dec. 25–26 (emphases added); *see also* 3PR Comments 5 (stating “[a]nother example of a 4-view of Yee, as further explained in Lachinski,[] includes a *single* image made out of four reduced size images”) (citing Yee 392; Lachinski 5:25–31, Fig. 3) (footnote omitted).

Lastly, Patent Owner’s arguments (Req. Reh’g 10–14) overlook the Decision’s further discussion of Dykes’s teachings in this regard. The June 2021 Decision additionally states:

> To the extent that Yee’s “composites of them” are not considered to teach or suggest “each composite image is created by processing pixel data of a plurality of the image frames” as claim 4 recites (for which we do not agree), *the rejection further relies on Dykes.* Dykes teaches a known technique for creating “composites” by combining and uniting image data (e.g., stitching) to produce a panoramic image. Dykes 132–36, Fig. 2. When substituting Dykes’s known technique of forming a composite (e.g., a panoramic image) for Yee’s composite image forming technique, “the combination must do more than yield a predictable result.” *KSR*, 550 U.S. at 416.[16] . . . Thus, combining Dykes’s teaching related to creating “a composite image” with Yee would have improved on Yee’s system by providing educational information, evoking a visual and engaging

[16] *KSR Int’l Co. v. Teleflex Inc.*, 550 U.S. 398, 416 (2007).

> experience, and provide the ability to navigate across a virtual space. *See KSR,* 550 U.S. at 417.

Dec. 23–24 (emphasis added); 3PR Comments 6 (citing Dec. 23; Sept. 2018 Decision 10 (vacated)).

Accordingly, we are not persuaded that the rejection fails to demonstrate that Yee, Lachinski, and Dykes teach or suggest "a composite image" as recited in claim 4, such that the Board misapprehended or overlooked a point in the newly presented ground.

2. Rational underpinning for combining Yee, Dykes, and Lachinski

Patent Owner "submits that it is unclear why one of skill in the art would have combined the cited Yee, Dykes, and Lachinski . . . to arrive at 'composite image' as properly construed under the *Phillips* standard." Req. Reh'g 14; *see id.* at 14–16 (quoting Dec. 23; Dykes 135) (reproducing Dykes, Fig. 2). Patent Owner argues that Dykes requires that there be a "small overlap" between images, Yee does not disclose the "small overlap" feature allegedly required by Dykes, and "it is unclear that the images acquired by Yee are suitable for use in the 'stitching feature' allegedly described by Dykes." *Id.* at 16.

We are not persuaded. As the Court states, "when a patent claims a structure already known in the prior art that is altered by the mere substitution of one element for another known in the field, the combination must do more than yield a predictable result." *KSR*, 550 U.S. at 417. As stated (*see* Dec. 23), combining Yee and Dykes to arrive at a "composite image" (e.g., a panoramic image) is no more than the simple substitution of one known element (e.g., Yee's "composites of them" (Yee 389)) for

another (e.g., Dykes's composite image arrived at by stitching images together (Dykes 134–36, Fig. 2)) or "the mere application of a known technique to a piece of prior art ready for the improvement." *KSR*, 550 U.S. at 417.

Moreover, Patent Owner does not demonstrate adequately that the proposed combination would not yield the predictable result of "a composite image" as claim 4 recites. *See* Req. Reh'g 14–16. As Requester indicates (*see* 3PR Comments 7–8), Yee captures many images, which would encompass the coverage needed to create Dykes's panoramic images. *See id.* at 7 (citing Yee 391) (noting Yee teaches 10 cameras capturing 63-degree horizontal, angled views). We further agree with Requester that Yee teaches or at least suggests to an ordinarily skilled artisan that some of its images would contain the needed overlap discussed in Dykes's stitching techniques (*see* Dykes 135) as evidenced by (1) the front, back, left, right, curbside, street, real estate, and address views (*see* Yee 389, 391), and (2) collecting data "looking <u>globally</u>" and "<u>comprehensively</u>" to "ensure[] no object is lost behind an obstruction" (*id.* at 390).

For the reasons discussed above, we are not persuaded that the rejection fails to provide a reason with a rational underpinning to combine Yee and Dykes and to arrive at the claims at issue, such that the Board misapprehended or overlooked a point in the newly presented ground.

Conclusion

For the foregoing reasons, Patent Owner has not identified a point that the Board misapprehended or overlooked in entering the new ground of claim 4 under 35 U.S.C. § 103(a) based on Yee, Lachinski, and Dykes.

B. *Ishida, Yee, and Dykes*

Claims 4 and 21 are rejected under 35 U.S.C. § 103(a) based on Ishida, Yee, and Dykes. Dec. 19, 27–37. Regarding the combination of Ishida, Yee, and Dykes, Patent Owner argues: (1) Ishida does not describe "a composite image" as claim 4 recites (Req. Reh'g 16), and (2) Ishida does not teach the Web Page Limitations in claim 21 because Ishida does not disclose invoking a display of a web page for a retail establishment (*id.* at 17–19).

1. *"[A] composite image" in Claim 4*

Patent Owner argues Ishida does not describe "a composite image" as claim 4 recites. Req. Reh'g 16. This assertion, however, fails to account for the teachings of Dykes related to "a composite image" as the rejection is formulated. *See* Dec. 27 (citing Request 210–222; RAN 17–19); *see also* Request 220–22 (citing Dykes 134–35, Fig. 2 to teach claim 4's recitations) (reproducing Dykes, Fig. 2 (annotated)). One cannot show nonobviousness by attacking references individually where the rejection, as is here, is based on combinations of references. *See In re Merck & Co.*, 800 F.2d 1091, 1097 (Fed. Cir. 1986). Moreover, as discussed above in the context of the rejection based on the Yee, Lachinski, and Dykes, Yee alone or Yee and Dykes in combination further teach or suggest creating "a composite image" as claim 4 recites. We refer to Section II.A.1 for more details.

Accordingly, we are not persuaded that the rejection fails to demonstrate that Ishida, Yee, and Dykes teach or suggest "a composite image" as recited in claim 4, such that the Board misapprehended or overlooked a point in the newly presented ground.

2. The Web Page Limitations in Claim 21

Patent Owner argues that Ishida does not disclose "invoking . . . a display of the web page" for the retail establishment under its proposed construction because it only discusses displaying information from a web page, not the web page itself. *See* Req. Reh'g 17–19 (quoting Dec. 50–51[17]; Ishida 28–29) (citing Ishida 24). Patent Owner further argues Ishida does not use a web browser to display the web page. *Id.* at 19 (citing Ishida 32–33).

As to the latter argument, we are not persuaded. Based on our construction in Section I.B, claim 21 does not require using a web browser to "invok[e] . . . a display of the web page on the display screen" as recited.

Regarding whether Ishida discloses "invoking . . . a display of the web page [for the retail establishment] on the display screen" found in claim 21, we also are not persuaded by Patent Owner's arguments. To be sure, Ishida does not use the term "web page" explicitly when discussing its digital city. However, Ishida discusses a "3DML WEB plug-in" (Ishida 27), "any site on the WEB" (*id.*), and "a WEB and ftp interface" (*id.* at 28) when addressing "a human interface to Digital City Kyoto that combines 2D maps with several 3DML spots." *Id.* at 27; *see also* Dec. 28 (stating Ishida's social information infrastructure "integrates both World Wide Web archives and real-time information related to the city *into WEB and ftp interface* (e.g., the interface or second layer) on the Internet") (emphasis added) (citing Ishida 23–25, 28–30, Fig. 5(b)), 28–29 (stating "each of these web pages in Ishida (e.g., WEB and ftp interface)"), 31 (discussing "WEB pages that are part of

[17] The quotation comes from the June 2021 Decision at pages 28–29.

Ishida's digital city interface"). Additionally, Ishida describes its digital city as "the Digital City Kyoto *site*." Ishida 31 (emphasis added). We thus disagree that Ishida does not state how the information in Ishida is displayed as Patent Owner argues. *See* Req. Reh'g 19. That is, the above passages address using an interaction layer (Ishida 25), a 3DML WEB plug-in (*id.* at 27), a WEB and ftp interface (*id.* at 28), and a WEB environment (*id.* at 31).

These portions of Ishida suggest to an ordinarily skilled artisan that its digital city and web interface displayed on a user's screen is a web page. Alternatively, these portions in Ishida at least suggest to an ordinarily skilled artisan that using a web page to display the information in Ishida's interface would have been an obvious variant in light of the similar functionality of displaying web information. *See KSR*, 550 U.S. at 417 ("When a work is available in one field of endeavor, design incentives and other market forces can prompt variations of it, either in the same field or a different one. If a person of ordinary skill can implement a predictable variation, § 103 likely bars its patentability."). Also, a person of ordinary of skill would have had good reasons to pursue displaying Ishida's interface as a web page because this technique was known as evidenced by Ishida. *See* Ishida 31 (discussing "the WEB environment" and "bring[ing] up web pages"). As such, Ishida at least suggests the recited "invoking . . . a display of the web page on the display screen" as claim 21 recites.

Patent Owner fails to address the above-noted passages in Ishida in the Request for Rehearing. Rather, Patent Owner quotes portions of the June 2021 Decision discussing that Ishida collects data from various web pages. *See* Req. Reh'g 17–18. Moreover, Requester provides another

example where a tour guide agent can bring up web pages. 3PR Comments 9–10 (citing Ishida 9[18]) (reproducing Ishida, Fig. 6). Given that Figure 6 shows the city project includes a web browser to present the information on the display screen, Ishida at least suggests that Ishida's digital city "invok[es] . . . a display of the web page on the display screen" as claim 21 recites.

Accordingly, we are not persuaded that the rejection fails to demonstrate that Ishida, Yee, and Dykes teach or suggest "invoking . . . a display of the web page on the display screen" as recited in claim 21, such that the Board misapprehended or overlooked a point in the newly presented ground based on Ishida, Yee, and Dykes.

Conclusion

For the foregoing reasons, Patent Owner has not identified a point that the Board misapprehended or overlooked in entering the new ground under 35 U.S.C. § 103(a) based on Ishida, Yee, and Dykes for claims 4 and 21.

CONCLUSION

We have granted the Request for Rehearing to the extent that we have reconsidered the Decision in light of Patent Owner's Request for Rehearing, but have denied the Request for Rehearing in all other respects.

[18] Requester refers to the pages in Ishida differently in its comments and the Request. *Compare* 3PR Comments 9 (citing Ishida 9), *with* Request 235–36 (quoting Ishida 30–31). We use similar page numbering to the Request. For example, in the above citation, page 9 cited in the Requester's comments is page 31.

Outcome of Decision on Rehearing:

Claim(s)	35 U.S.C. §	Reference(s)/Basis	Denied	Granted
4	103(a)	Yee, Dykes, Lachinski	4	
4, 21	103(a)	Ishida, Yee, Dykes	4, 21	
Overall Outcome			4, 21	

Final Outcome of Appeal after Rehearing:

Claim(s)	35 U.S.C. §	Reference(s)/Basis	Affirmed	Reversed	New Ground
4	102(a)	Dykes		4	
4	102(b)	Yee		4	
4	102(a)	Al-Kodmany		4	
4	102(a)	Bates		4	
4	103(a)	Murphy, Yee		4	
4	103(a)	Shiffer, Yee		4	
4, 21	103(a)	Ishida, Dykes		4, 21	
4	103(a)	Yee, Dykes, Lachinski			4
4, 21	103(a)	Ishida, Yee, Dykes			4, 21
Overall Outcome				4, 21	4, 21

Requests for extensions of time in this *inter partes* reexamination proceeding are governed by 37 C.F.R. § 1.956. *See* Manual of Patent Examining Procedure (MPEP) § 2665; *see also* 37 C.F.R. § 41.79.

DENIED

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US007239760B2

(12) **United States Patent**
Di Bernardo et al.

(10) **Patent No.: US 7,239,760 B2**
(45) **Date of Patent: Jul. 3, 2007**

(54) **SYSTEM AND METHOD FOR CREATING, STORING, AND UTILIZING COMPOSITE IMAGES OF A GEOGRAPHIC LOCATION**

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(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 0 days.

(21) Appl. No.: **11/130,004**

(22) Filed: **May 16, 2005**

(65) **Prior Publication Data**

US 2005/0207672 A1 Sep. 22, 2005

Related U.S. Application Data

(62) Division of application No. 09/758,717, filed on Jan. 11, 2001, now Pat. No. 6,895,126.

(60) Provisional application No. 60/238,490, filed on Oct. 6, 2000.

(51) **Int. Cl.**
G06K 9/60 (2006.01)
G08G 1/123 (2006.01)
H04N 7/00 (2006.01)
G01C 21/00 (2006.01)

(52) **U.S. Cl.** **382/305**; 340/995.1; 348/113; 701/207

(58) **Field of Classification Search** 382/103, 382/104, 113, 305, 284, 285; 340/990, 995.1, 340/995.11, 995.17; 348/113–118; 701/200–213; 707/1, 100
See application file for complete search history.

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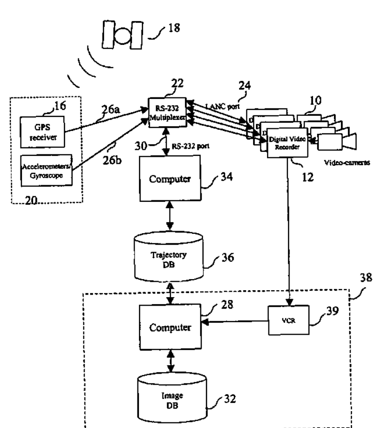
(Continued)

Primary Examiner—Kanjibhai Patel
(74) *Attorney, Agent, or Firm*—Christie, Parker & Hale, LLP

(57) **ABSTRACT**

A system and method synthesizing images of a locale to generate a composite image that provide a panoramic view of the locale. A video camera moves along a street recording images of objects along the street. A GPS receiver and inertial navigation system provide the position of the camera as the images are being recorded. The images are indexed with the position data provided by the GPS receiver and inertial navigation system. The composite image is created on a column-by-column basis by determining which of the acquired images contains the desired pixel column, extracting the pixels associated with the column, and stacking the columns side by side. The composite images are stored in an image database and associated with a street name and number range of the street being depicted in the image. The image database covers a substantial amount of a geographic area allowing a user to visually navigate the area from a user terminal.

38 Claims, 18 Drawing Sheets



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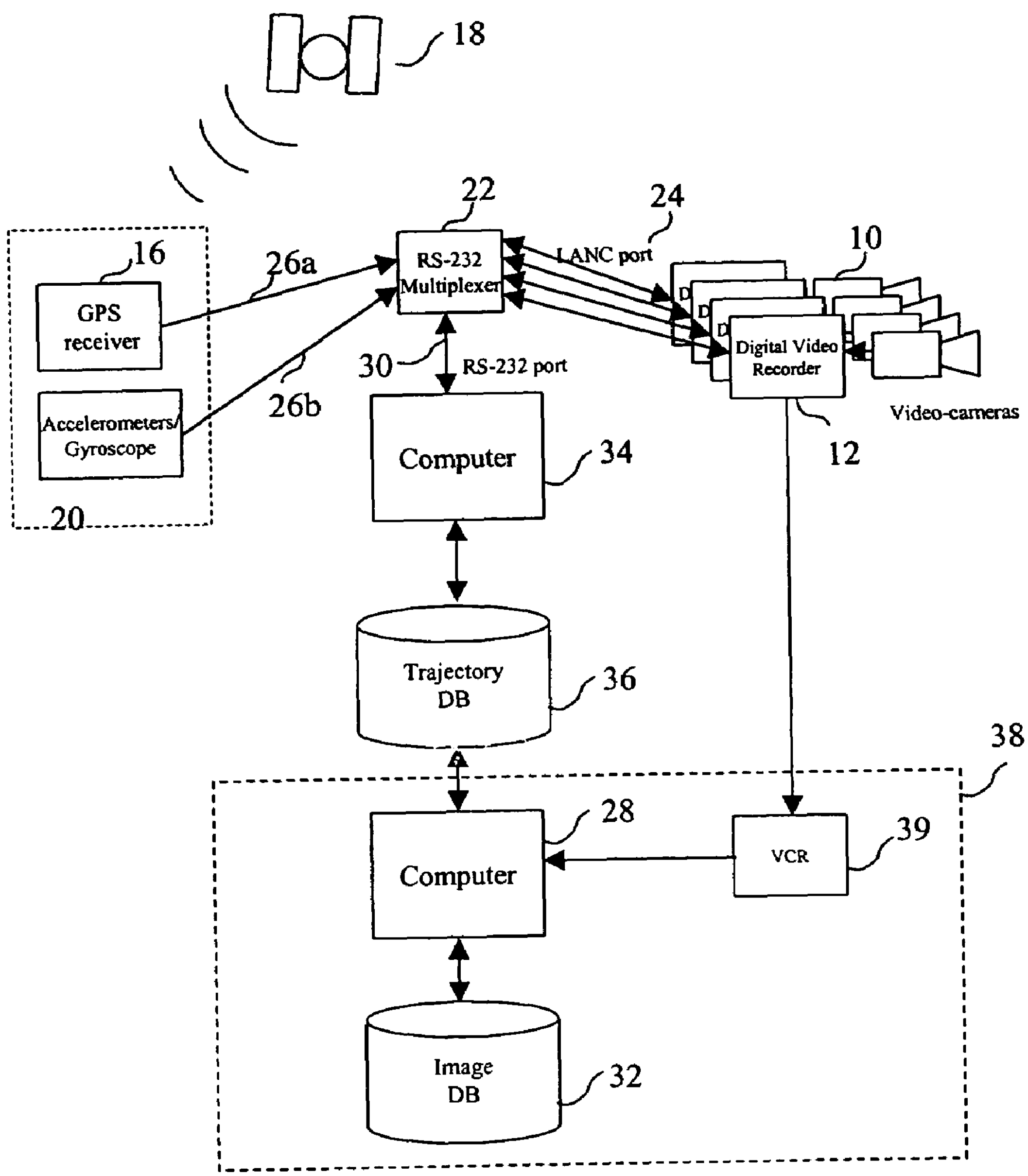
18
22
24
LANC port
10
16
26a
RS-232
Multiplexer
GPS
receiver
Digital Video
Recorder
30
RS-232 port
26b
Accelerometers/
Gyroscope
Video-cameras
Computer
34
12
20
Trajectory
DB
36
38
28
Computer
VCR
39
Image
DB
32

Fig. 1

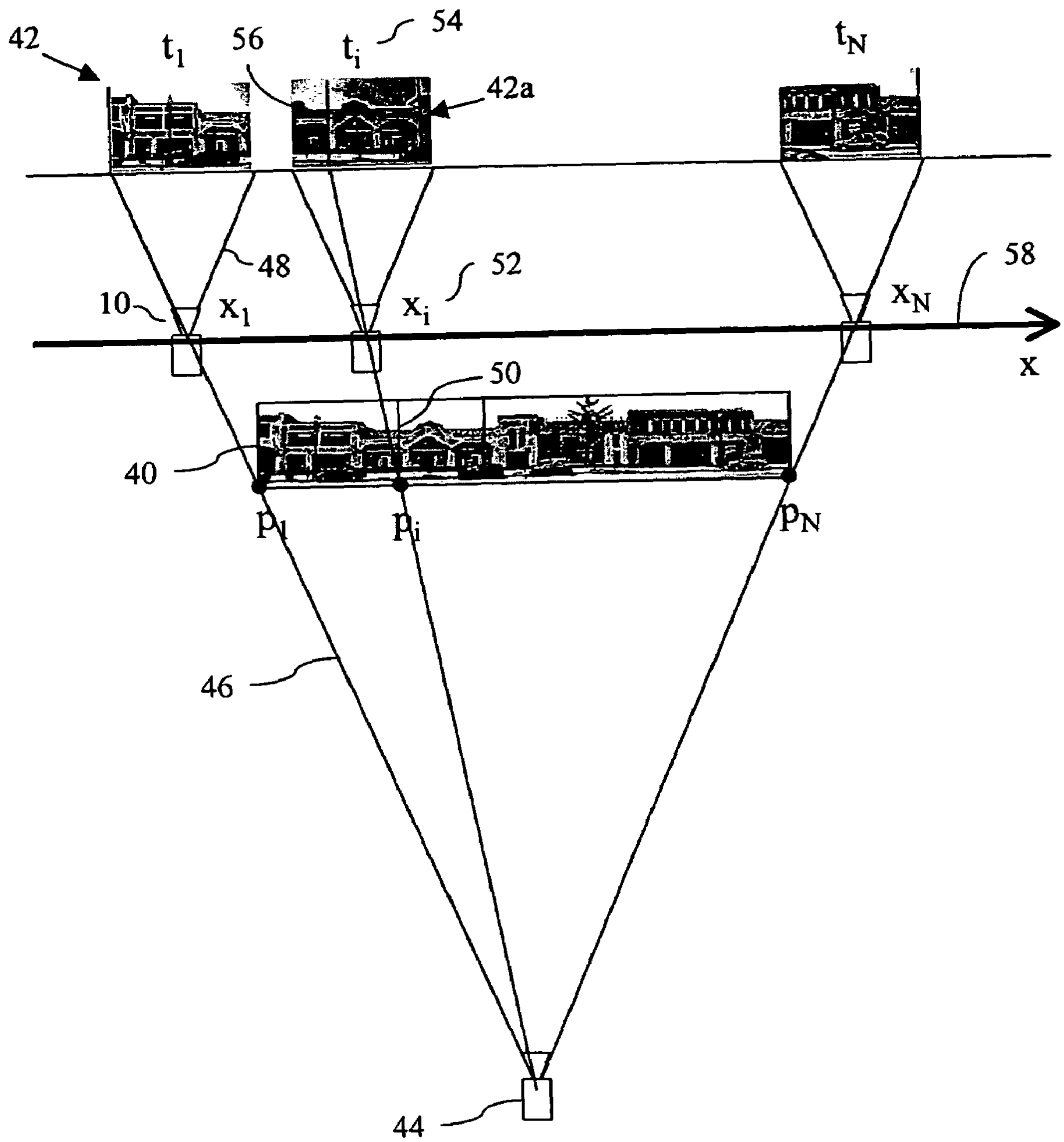

Fig.2

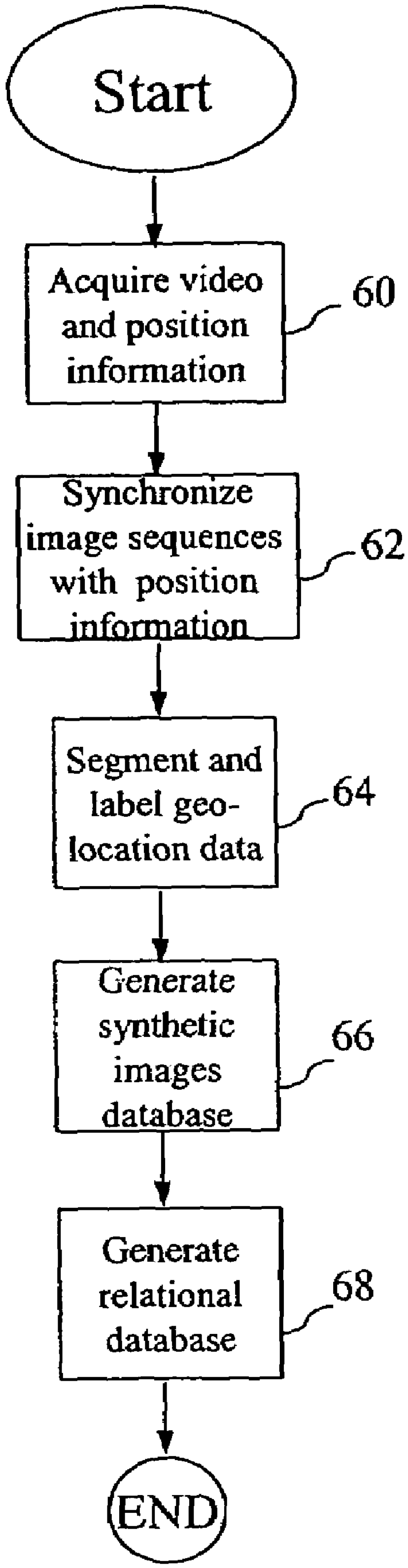
Start
Acquire video and position information
60
Synchronize image sequences with position information
62
Segment and label geo-location data
64
Generate synthetic images database
66
Generate relational database
68
END

Fig.3

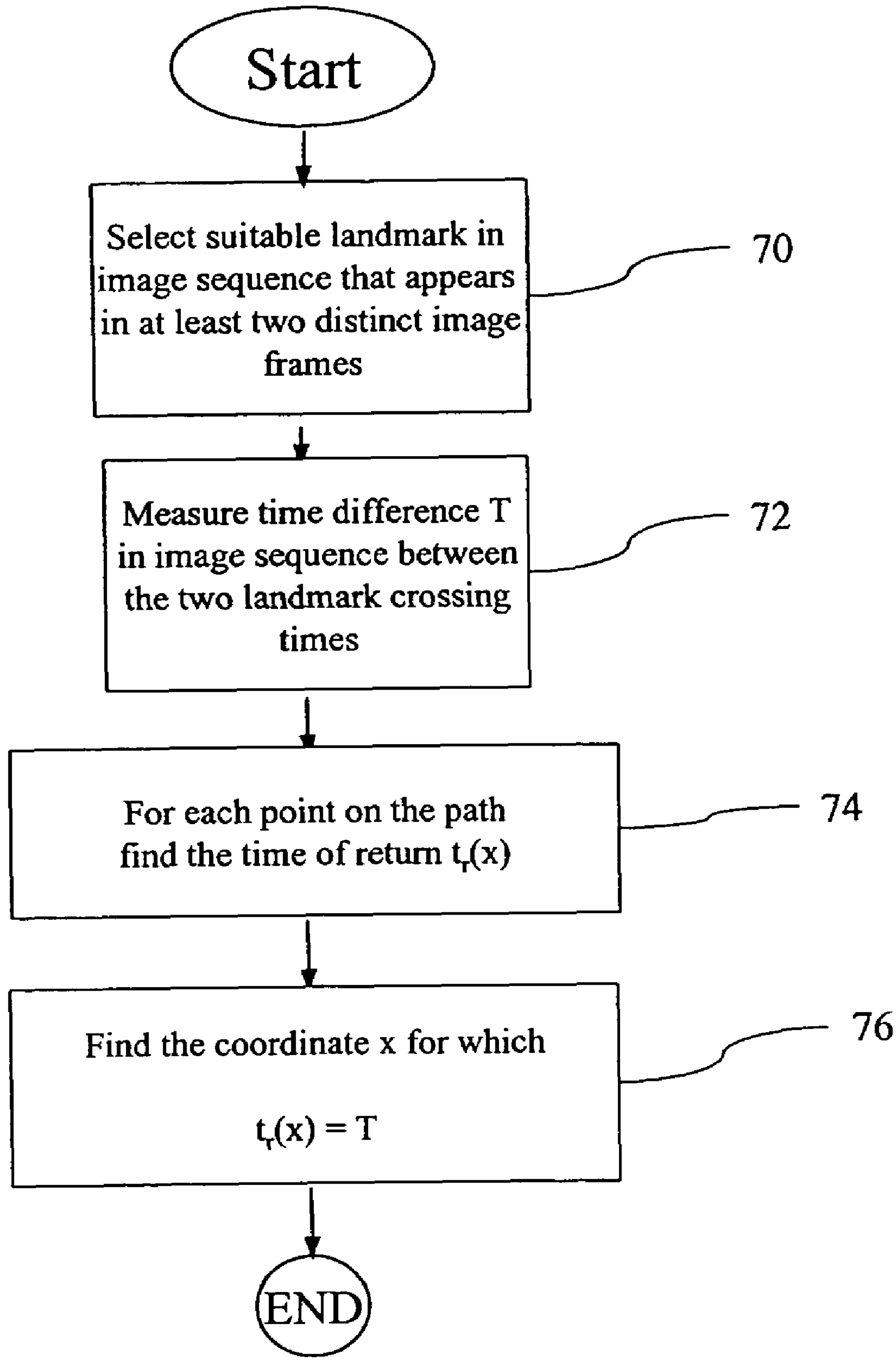
Start
Select suitable landmark in image sequence that appears in at least two distinct image frames
70
Measure time difference T in image sequence between the two landmark crossing times
72
For each point on the path find the time of return $t_r(x)$
74
Find the coordinate x for which
$t_r(x) = T$
76
END

Fig.4

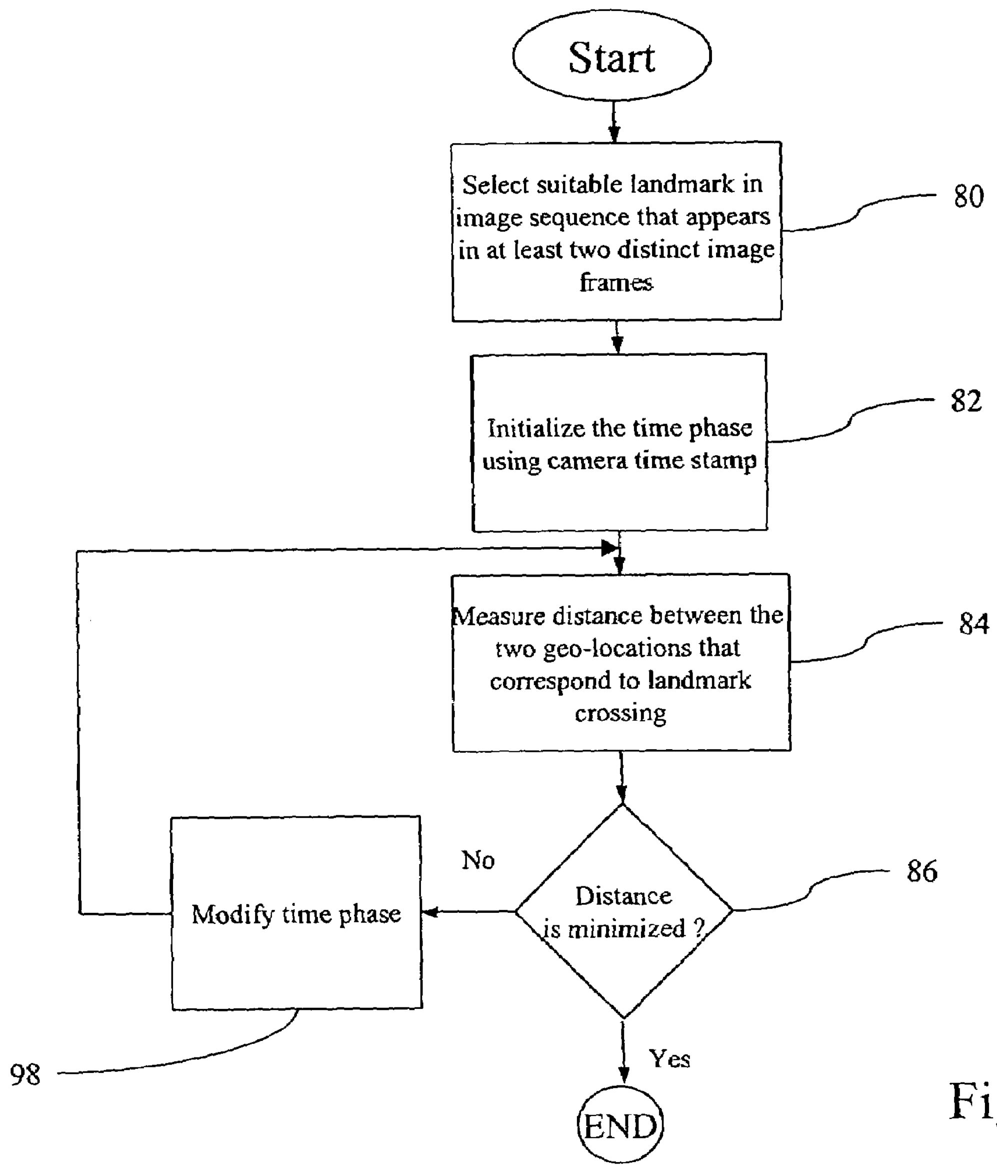
Start
Select suitable landmark in image sequence that appears in at least two distinct image frames
80
Initialize the time phase using camera time stamp
82
Measure distance between the two geo-locations that correspond to landmark crossing
84
Distance is minimized ?
86
No
Yes
Modify time phase
98
END

Fig.5

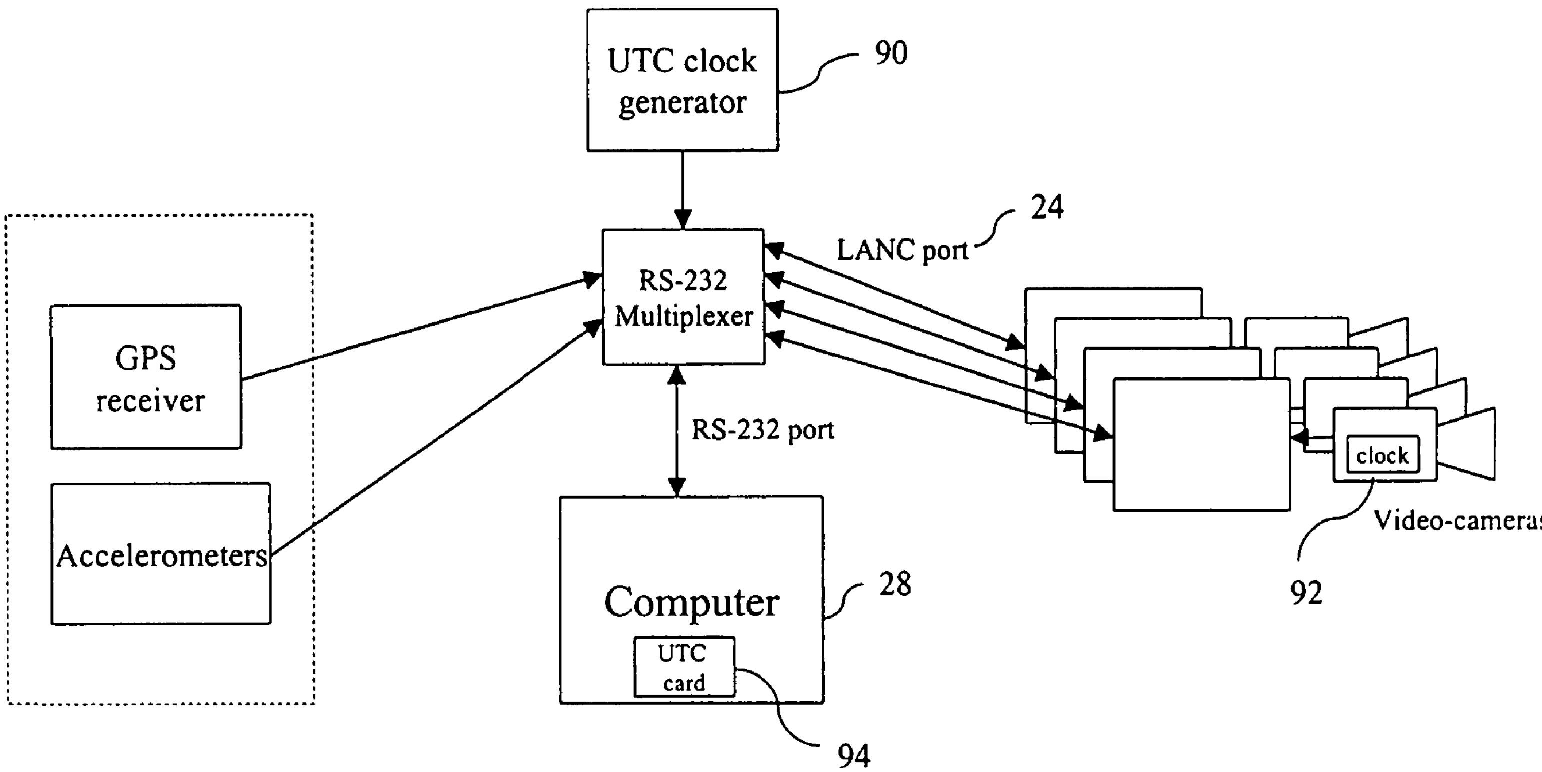
UTC clock generator
90
RS-232 Multiplexer
LANC port
24
GPS receiver
Accelerometers
RS-232 port
Computer
UTC card
28
94
clock
Video-cameras
92

Fig.6

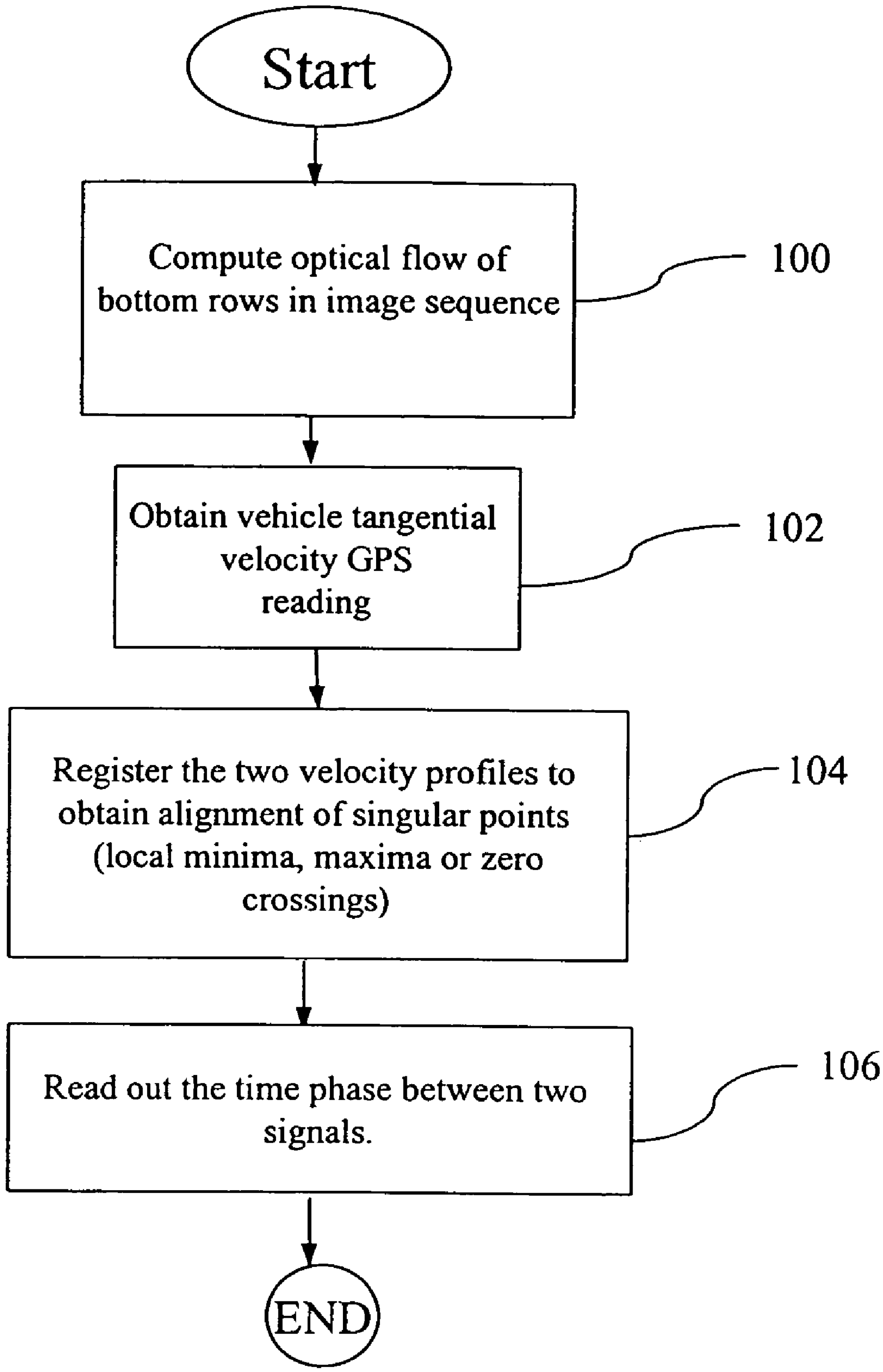
Start
Compute optical flow of bottom rows in image sequence
100
Obtain vehicle tangential velocity GPS reading
102
Register the two velocity profiles to obtain alignment of singular points (local minima, maxima or zero crossings)
104
Read out the time phase between two signals.
106
END

Fig.7

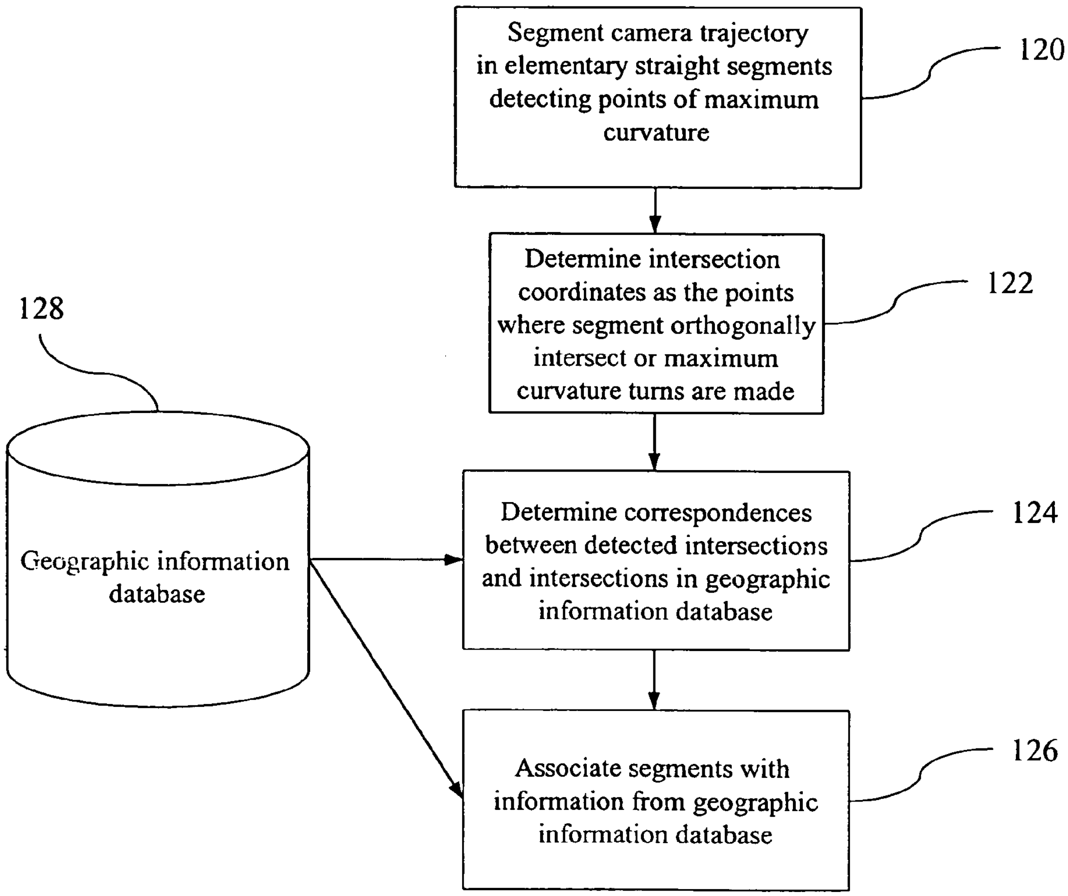
Segment camera trajectory in elementary straight segments detecting points of maximum curvature
120
Determine intersection coordinates as the points where segment orthogonally intersect or maximum curvature turns are made
122
128
Geographic information database
Determine correspondences between detected intersections and intersections in geographic information database
124
Associate segments with information from geographic information database
126

Fig.8

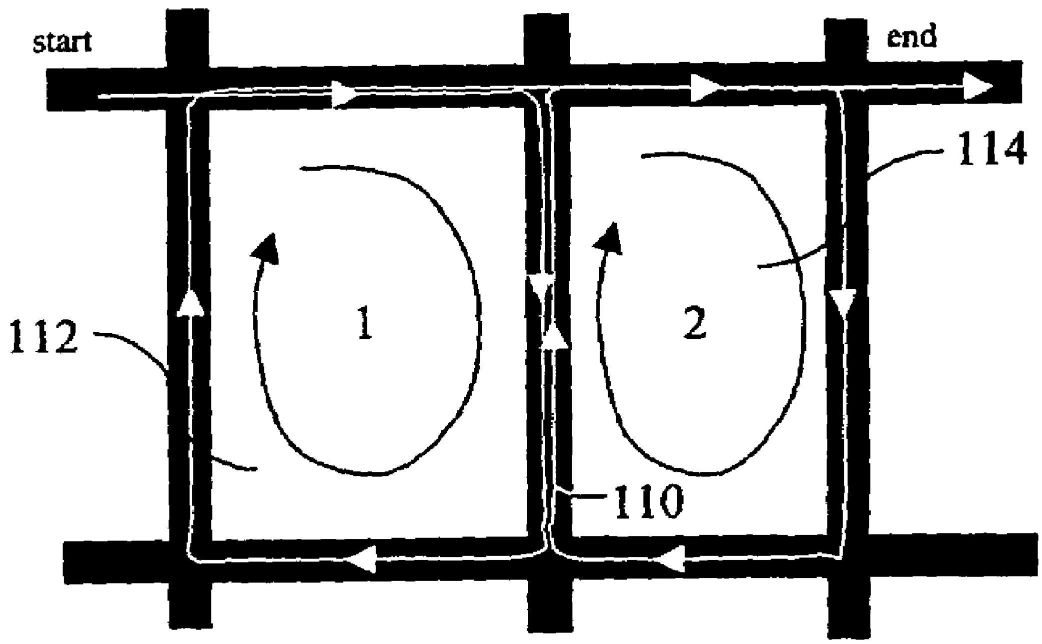

Fig.9

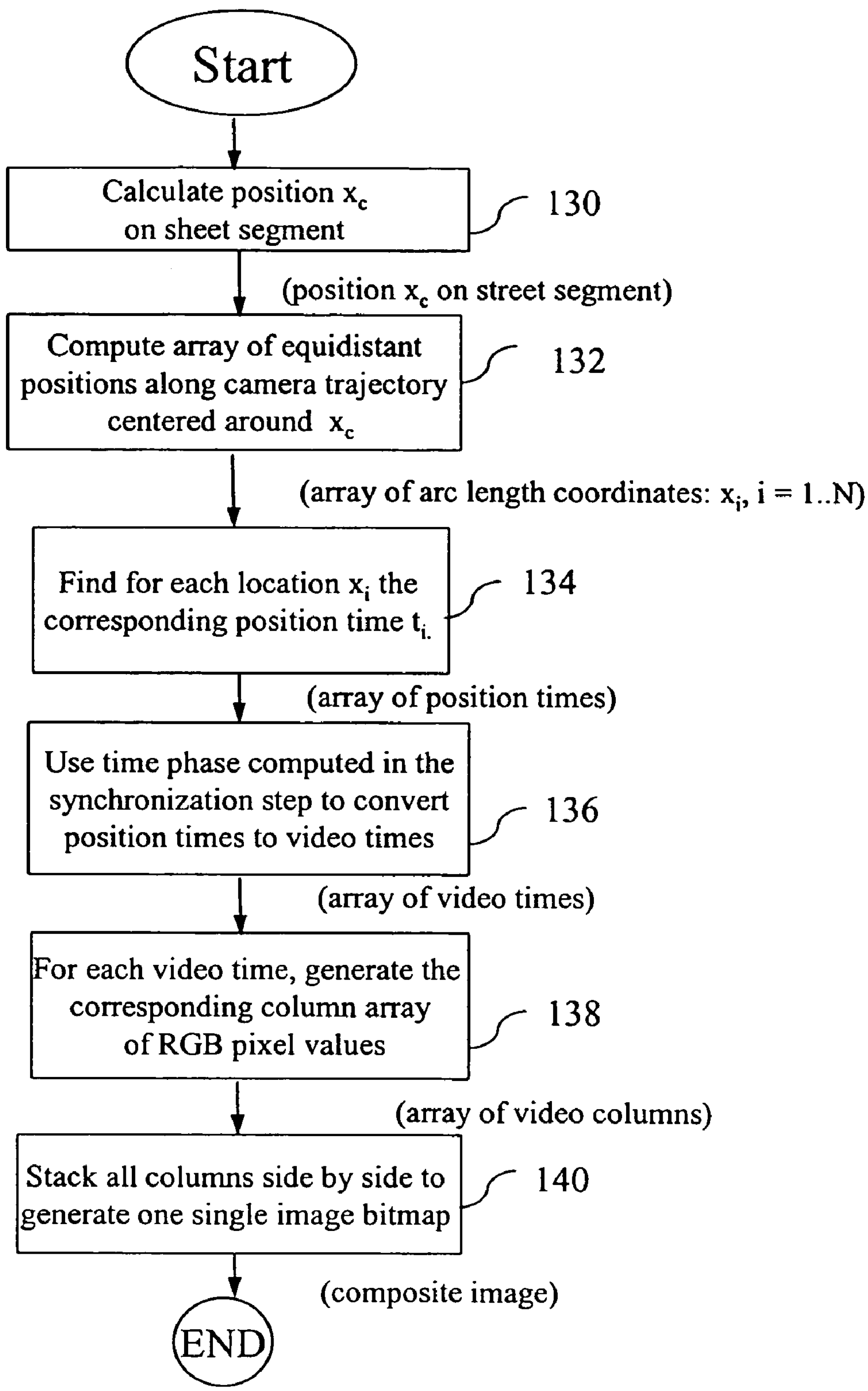
Start
Calculate position x_c on sheet segment
130
(position x_c on street segment)
Compute array of equidistant positions along camera trajectory centered around x_c
132
(array of arc length coordinates: x_i, i = 1..N)
Find for each location x_i the corresponding position time t_i.
134
(array of position times)
Use time phase computed in the synchronization step to convert position times to video times
136
(array of video times)
For each video time, generate the corresponding column array of RGB pixel values
138
(array of video columns)
Stack all columns side by side to generate one single image bitmap
140
(composite image)
END

Fig.10

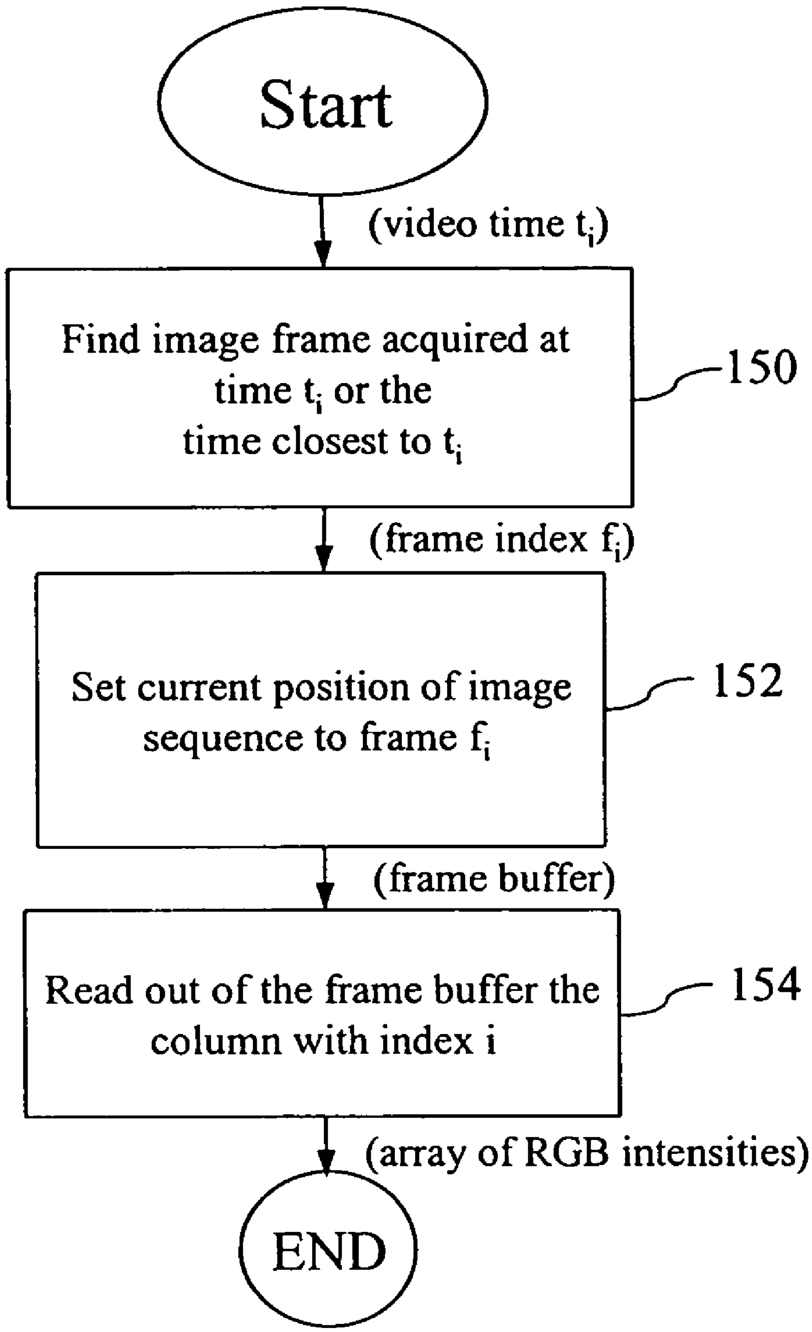
Start
(video time t_i)
Find image frame acquired at time t_i or the time closest to t_i
150
(frame index f_i)
Set current position of image sequence to frame f_i
152
(frame buffer)
Read out of the frame buffer the column with index i
154
(array of RGB intensities)
END

Fig.11

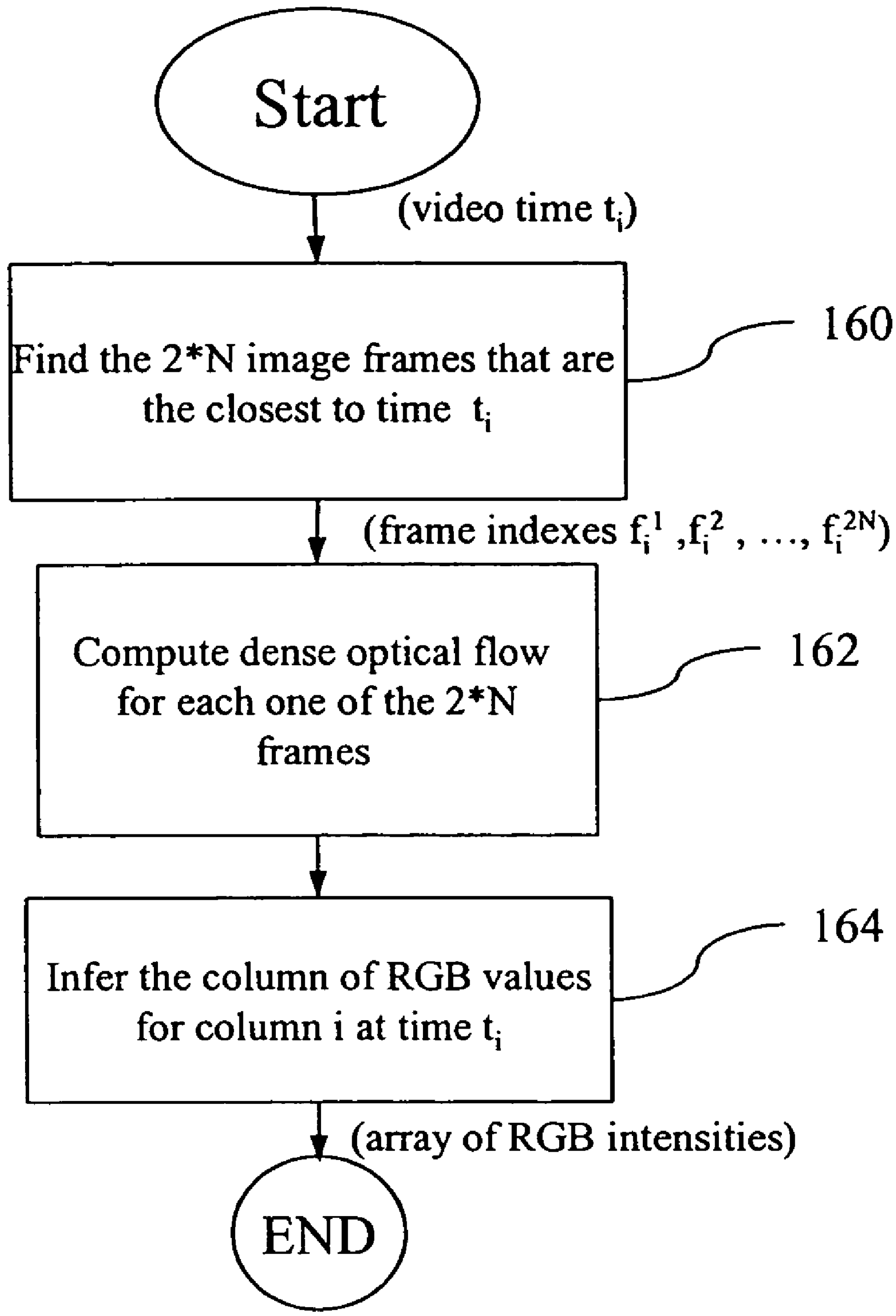
Start
(video time t_i)
Find the 2*N image frames that are the closest to time t_i
160
(frame indexes $f_i^1, f_i^2, \ldots, f_i^{2N}$)
Compute dense optical flow for each one of the 2*N frames
162
Infer the column of RGB values for column i at time t_i
164
(array of RGB intensities)
END

Fig.12

172	174	176	178	180	182	184	186	188
Segment ID	Street Name	Side of Street with Respect to Hub	End Point Coordinates	Segments Adjacent to From Coordinates	Segments Adjacent to To Coordinates	Distance from Hub	Length of Trajectory Segment	Offset
1	Colorado Boulevard	West	(10, 10), (50, 10)	2(N) 4(S) 3(W) 1(E)	5(N) 7(S) 1(W) 6(E)	(120m, 122m)	(28m, 30m)	(2,0)
6	Colorado Boulevard	West	(50, 10) (65,10)	5(N) 7(S) 1(W) 6(E)	8(W) 10(S) 6(W) 9(E)	(130m, 134m)	(20m, 22m)	(0,0)

170

Fig. 13

200

202 Segment ID	204 Side Viewed	206 Distance of Center Position
1	Even	8m
2	Odd	8m
1	Even	16m

Fig. 14

212 214

Block Label	Segment IDs
(50, 50)	1, 4, 7, 9
(50, 100)	2, 5, 8, 10, 11

210

Fig. 15

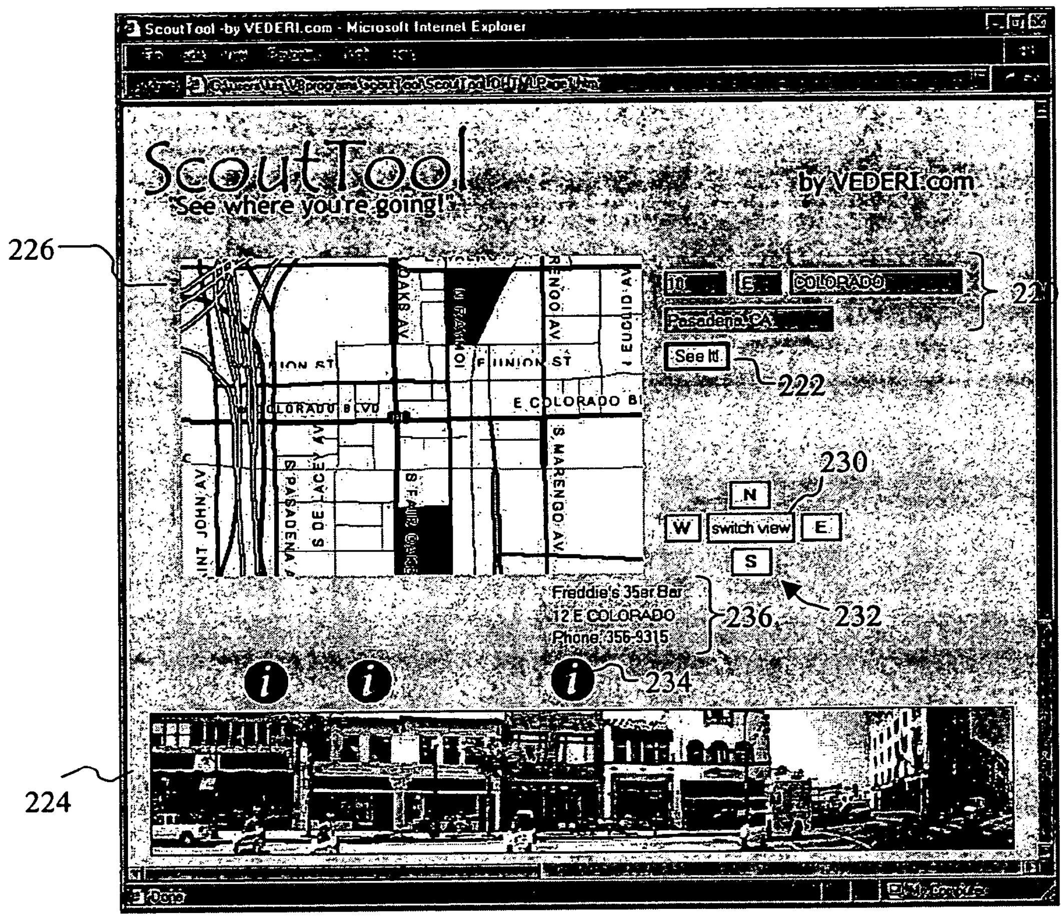
ScoutTool -by VEDERI.com - Microsoft Internet Explorer
ScoutTool
See where you're going!
by VEDERI.com
226
220
222
230
232
236
234
224
E
COLORADO
Pasadena, CA
See It!
N
W
switch view
E
S
Freddie's 35er Bar
12 E COLORADO
Phone: 356-9315
OAK AV
E UNION ST
E COLORADO BL
COLORADO BLVD
S MARENGO AV
S DE LACEY AV
S PASADENA AV
S FAIR OAKS
EUCLID AV

Fig.16

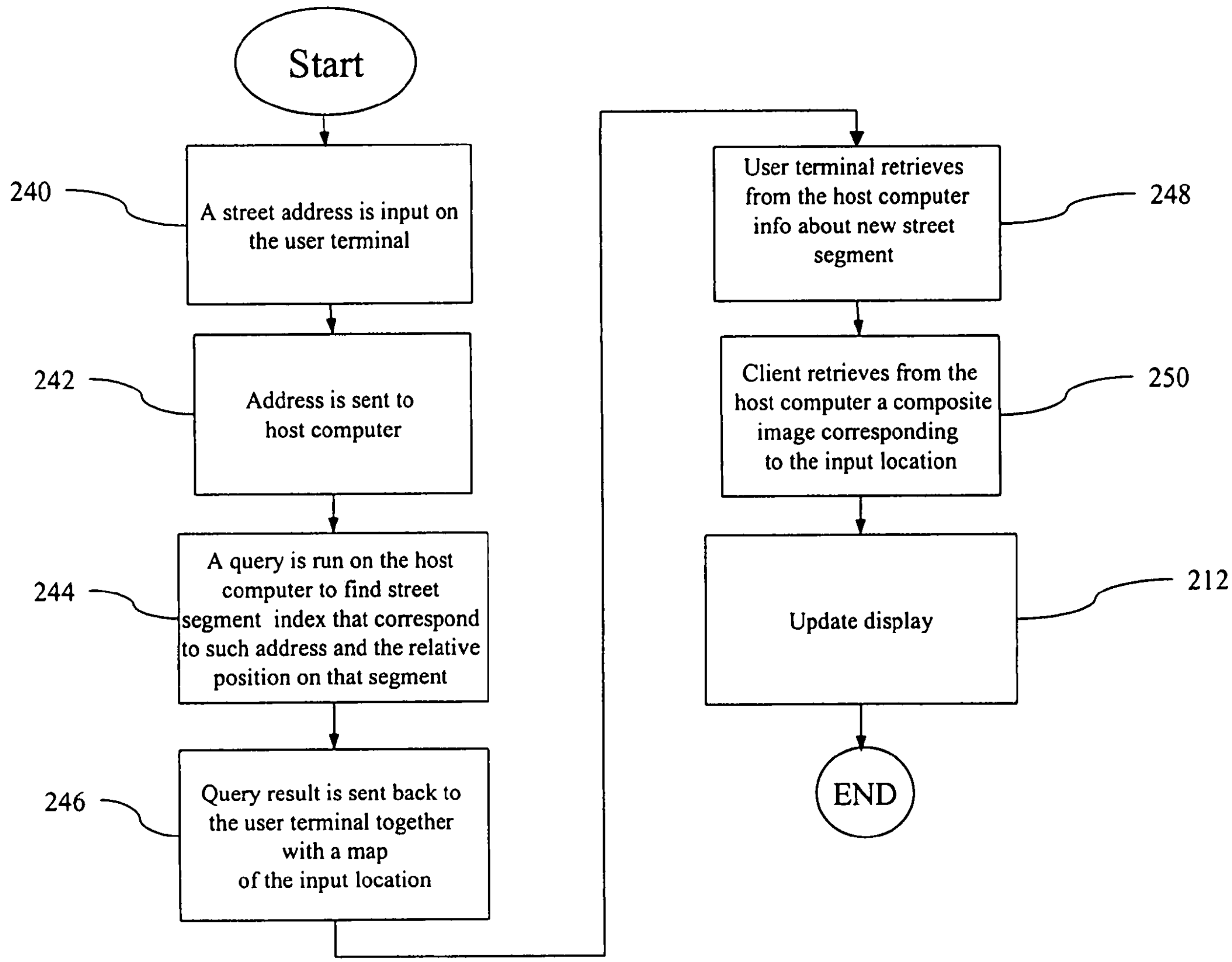
Start
240
A street address is input on the user terminal
242
Address is sent to host computer
244
A query is run on the host computer to find street segment index that correspond to such address and the relative position on that segment
246
Query result is sent back to the user terminal together with a map of the input location
248
User terminal retrieves from the host computer info about new street segment
250
Client retrieves from the host computer a composite image corresponding to the input location
212
Update display
END

Fig.17

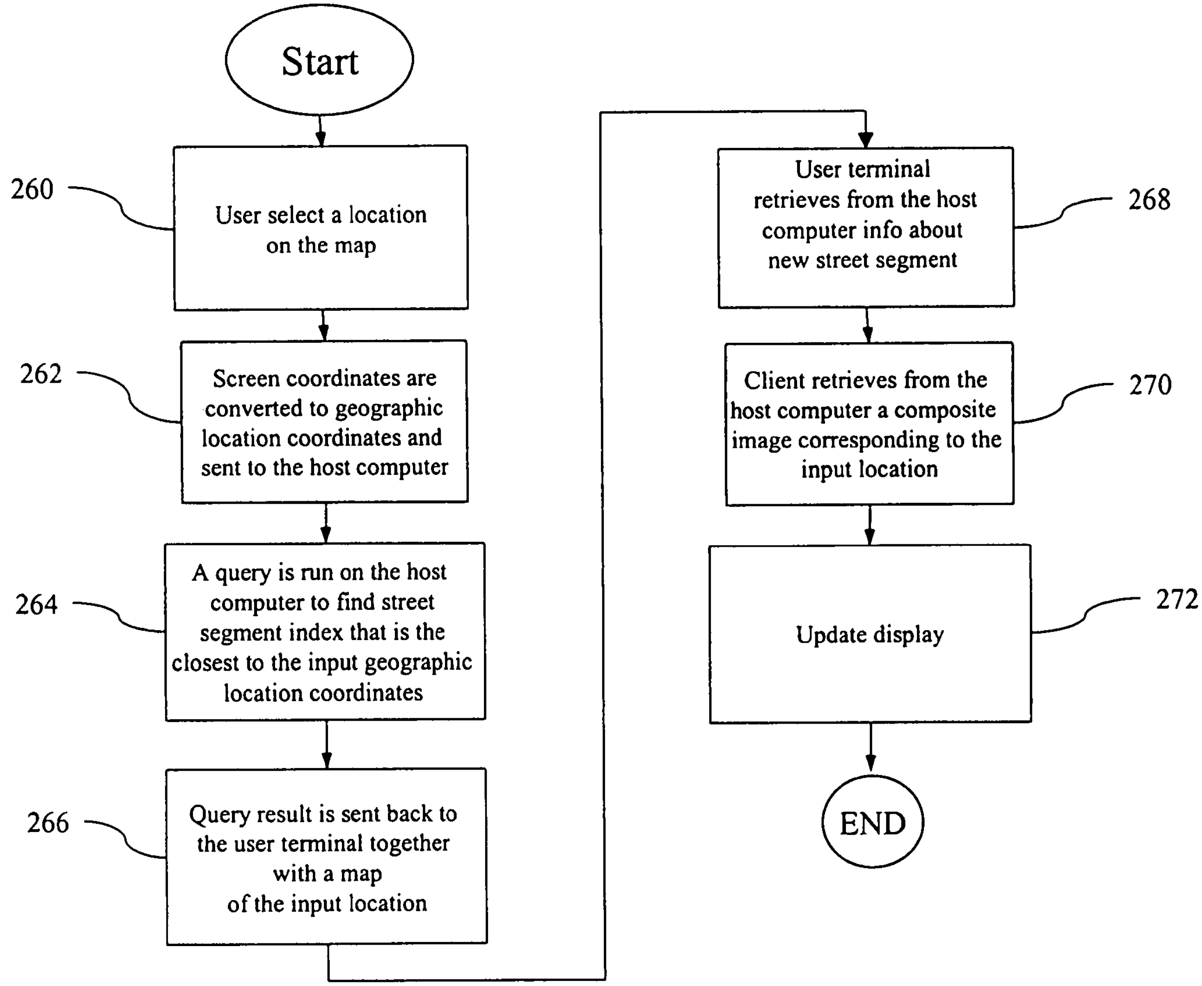
Start
260
User select a location on the map
262
Screen coordinates are converted to geographic location coordinates and sent to the host computer
264
A query is run on the host computer to find street segment index that is the closest to the input geographic location coordinates
266
Query result is sent back to the user terminal together with a map of the input location
268
User terminal retrieves from the host computer info about new street segment
270
Client retrieves from the host computer a composite image corresponding to the input location
272
Update display
END

Fig.18

SYSTEM AND METHOD FOR CREATING, STORING, AND UTILIZING COMPOSITE IMAGES OF A GEOGRAPHIC LOCATION

CROSS-REFERENCE TO RELATED APPLICATION(S)

This application is a divisional of application Ser. No. 09/758,717 filed Jan. 11, 2001, now U.S. Pat. No. 6,895,126, issued May 17, 2005, which claims the benefit of U.S. provisional patent application No. 60/238,490, filed Oct. 6, 2000, the disclosures of which are hereby incorporated by reference in their entirety for all purposes.

FIELD OF THE INVENTION

This invention relates to visual databases, specifically to the creation and utilization of visual databases of geographic locations.

BACKGROUND OF THE INVENTION

There exist methods in the prior art for creating visual databases of geographic locations. However, such databases are of limited use due to the method of acquiring the imagery as well as the kind of imagery acquired. One particular method involves the taking of individual photographs of the location and electronically pasting the photographs on a polygonal mesh that provide the framework for a three-dimensional (3D) rendering of the location. This method, however, is time consuming and inefficient for creating large, comprehensive databases covering a substantial geographic area such as an entire city, state, or country.

Another method uses video technology to acquire the images. The use of video technology, especially digital video technology, allows the acquisition of the image data at a higher rate, reducing the cost involved in creating the image databases. For example, the prior art teaches the use of a vehicle equipped with a video camera and a Global Positioning System (GPS) to collect image and position data by driving through the location. The video images are later correlated to the GPS data for indexing the imagery. Nevertheless, such a system is still limited in its usefulness due to the lack of additional information on the imagery being depicted.

The nature of the acquired imagery also limits the usefulness of such a system. A single image acquired by the video camera contains a narrow field of view of a locale (e.g. a picture of a single store-front) due to the limited viewing angle of the video camera. This narrow field of view provides little context for the object/scene being viewed. Thus, a user of such an image database may find it difficult to orient himself or herself in the image, get familiar with the locale, and navigate through the database itself.

One way to increase the field of view is to use a shorter focal length for the video camera, but this introduces distortions in the acquired image. Another method is to increase the distance between the camera and the buildings being filmed. However, this may not be possible due to the limit on the width of the road and constructions on the opposite side of the street.

The prior art further teaches the dense sampling of images of an object/scene to provide different views of the object/scene. The sampling is generally done in two dimensions either within a plane, or on the surface of an imaginary sphere surrounding the object/scene. Such a sampling, however, is computationally intensive and hence cumbersome and inefficient in terms of time and cost.

Accordingly, there is a need for a system and method for creating a visual database of a comprehensive geographic area in a more time and cost efficient manner. Such a system should not require the reconstruction of 3D scene geometry nor the dense sampling of the locale in multiple dimensions. Furthermore, the images in the database should provide a wider field of view of a locale to provide context to the objects being depicted. The database should further correlate the images with additional information related to the geographic location and objects in the location to further enhance the viewing experience.

SUMMARY OF THE INVENTION

The present invention addresses and alleviates the above-mentioned deficiencies associated with the prior art. More particularly, the present invention is directed to a computer-implemented system and method for synthesizing images of a geographic location to generate composite images of the location. The geographic location may be a particular street in a geographic area with the composite images providing a view of the objects on each side of the street.

According to one aspect of the invention, an image recording device moves along a path recording images of objects along the path. A GPS receiver and/or inertial navigation system provides position information of the image recording device as the images are being acquired. The image and position information is provided to a computer to associate each image with the position information.

The computer synthesizes image data from the acquired images to create a composite image depicting a view of the objects from a particular location outside of the path. Preferably, the composite image provides a field of view of the location that is wider than the field of view provided by any single image acquired by the image recording device.

In another aspect of the invention, the path of the camera is partitioned into discrete segments. Each segment is preferably associated with multiple composite images where each composite image depicts a portion of the segment. The composite images and association information are then stored in an image database.

In yet another aspect of the invention, the image database contains substantially all of the static objects in the geographic area allowing a user to visually navigate the area from a user terminal. The system and method according to this aspect of the invention identifies a current location in the geographic area, retrieves an image corresponding to the current location, monitors a change of the current location in the geographic area, and retrieves an image corresponding to the changed location. A map of the location may also be displayed to the user along with information about the objects depicted in the image.

DESCRIPTION OF THE DRAWINGS

FIG. **1** is a schematic block diagram of a data acquisition and processing system for acquiring image and position data used to create composite images of a geographic location;

FIG. **2** is an illustration of a composite image created by the data acquisition and processing system of FIG. **1**;

FIG. **3** is a high-level flow diagram of the steps exercised by the data acquisition and processing system of FIG. **1** in creating and storing the composite images;

FIG. **4** is a flow diagram for synchronizing image sequences with position sequences of a recording camera according to one embodiment of the invention;

FIG. **5** is a flow diagram of an alternative embodiment for synchronizing image sequences with position sequences of a recording camera;

FIG. **6** is a block diagram of the data acquisition and processing system of FIG. **1** allowing a real-time synchronization of image and position data;

FIG. **7** is another embodiment for synchronizing image sequences with position sequences of a recording camera;

FIG. **8** is a flow diagram for segmenting and labeling a camera trajectory;

FIG. **9** is an illustration of a trajectory in a single camera scenario;

FIG. **10** is a flow diagram for creating a composite image of a segment of a camera's path;

FIG. **11** is a flow diagram for identifying and retrieving an optical column from an acquired image according to one embodiment of the invention;

FIG. **12** is a flow diagram for identifying and retrieving an optical column from an acquired image according to an alternative embodiment of the invention;

FIG. **13** is an illustration of an exemplary street segments table including street segments in a camera's trajectory;

FIG. **14** is an illustration of an exemplary image coordinates table for associating composite images with the street segments in the street segments table of FIG. **13**;

FIG. **15** is an illustration of an exemplary segment block table for allowing an efficient determination of a segment that is closest to a particular geographic coordinate;

FIG. **16** is an illustration of an exemplary graphical user interface for allowing the user to place requests and receive information about particular geographic locations;

FIG. **17** is a flow diagram of a process for obtaining image and location information of an express street address; and

FIG. **18** is a flow diagram of the process for obtaining image and location information of a location selected from a map.

DETAILED DESCRIPTION OF THE INVENTION

FIG. **1** is a schematic block diagram of a data acquisition and processing system for acquiring and processing image and position data used to create composite images of a geographic location. The composite images are created by synthesizing individual image frames acquired by a video camera moving through the location and filming the objects in its view. The composite images may depict on urban scene including the streets and structures of an entire city, state, or country. The composite images may also depict other locales such as a zoo, national park, or the inside of a museum, allowing a user to visually navigate the locale.

The data acquisition and processing system includes one or more image recording devices preferably taking the form of digital video cameras **10** moving along a trajectory/path and recording images on the trajectory on digital videotapes **12**. Other types of acquisition devices may also be used in combination to, or in lieu of, the digital cameras **10**, such as analog cameras. Furthermore, the video images may be recorded on optical, magnetic, or silicon video tapes, or on any other known types of storage devices that allow random access of particular image frames and particular video pixels within the image frames.

The data acquisition and processing system further includes a GPS receiver **16** for receiving position information from a set of GPS satellites **18** as the cameras **10** move along the trajectory. An inertial navigation system **20** including one or more accelerometers and/or gyroscopes also provides position information to the data acquisition and processing system. When the inertial navigation system **20** is used in conjunction with the GPS receiver **16**, a more accurate calculation of the position information may be produced.

In an alternative embodiment, position information is acquired using devices other than the inertial navigation system **20** and/or the GPS receiver **16**, such as via computer-vision-based algorithms that compute positions using video information from the video cameras **10**.

The video cameras **10** provide to a multiplexer **22** a frame number and time information for each image acquired via a communication link **24** preferably taking the form of a LANC™ port. The GPS receiver **16** and inertial navigation system **20** also provide position information to the multiplexer **22** via communication links **26***a*, **26***b*, preferably taking the form of RS-232 ports. The multiplexer **22** in turn transmits the received frame number, time information, and position data to a data acquisition computer **34** via a communication link **30**, which also preferably takes the form of an RS-232 port. The computer **34** stores in a trajectory database **36** the position data from the GPS receiver **16** and/or inertial navigation system **20** along with the frame number and time information from the video cameras **10**. This information is then used by a post-processing system **38** to create the composite images.

The post-processing system **38** preferably includes a post-processing computer **28** in communication with a video player **39**. The computer **28** preferably includes a video acquisition card for acquiring and storing the image sequences as the video player **39** plays the videotapes **12** of the acquired images. The computer **28** includes a processor (not shown) programmed with instructions to take the image and position data and create one or more composite images for storing into an image database **32**. The image database **32** is preferably a relational database that resides in a mass storage device taking the form of a hard disk drive or drive array. The mass storage device may be part of the computer **28** or a separate database server in communication with the computer.

In an alternative embodiment, the images are transferred directly to the data acquisition computer **34** as the images are being recorded. In this scenario, the computer **34** is preferably equipped with the video acquisition card and includes sufficient storage space for storing the acquired images. In this embodiment, the data acquisition computer **34** preferably contains program instructions to create the composite images from the acquired images.

In general terms, a composite image of a particular geographic location is created by using at least one video camera **10** recording a series of video images of the location while moving along a path. In the one camera scenario, the camera **10** is moved twice on the same path but in opposite directions to film the objects on both sides of the path. Movement to the camera **10** is provided by a base, platform, or motor vehicle moving at an average speed of preferably about 20 miles/hour to ensure a sufficient resolution in the resulting images. Video cameras with higher sampler rates may allow for faster acquisition speeds.

Preferably, the data acquisition and processing system uses four cameras **10** mounted on top of a moving motor vehicle. Two side cameras face each side of the path for filming objects viewed from the each side of the vehicle. A front and back cameras allow the filming of the objects

viewed from the front and back of the vehicle. The front and back cameras may be equipped with fish-eye lens for providing a wide-angle view of the path. A person skilled in the art should recognize, however, that additional cameras may be used to film the objects from different viewing directions. For example, a duodecahedron of cameras may be used to record the objects from all viewing directions. Furthermore, the side cameras need not face directly to the side of the street, but may face a slightly forward or backward direction to provide a look up or down of the path.

As the images acquired by the cameras **10** are recorded on the videotapes **12**, the frame number and time associated with the images are transferred to the data acquisition computer **34**. The images recorded on the videotapes **12** are later transferred to the post-processing computer **28** for further processing. Once the images are received, the computer **28** stores the image data in its memory in its original form or as a compressed file using one of various well-known compression schemes, such as MPEG.

As the camera **10** moves along the path and records the objects in its view, the GPS receiver **16** computes latitude and longitude coordinates using the information received from the set of GPS satellites **18** at selected time intervals (e.g. one sample every two seconds). The latitude and longitude coordinates indicate the position of the camera **10** during the recording of a particular image frame. The GPS satellite **18** also transmits to the GPS receiver **16** a Universal Time Coordinate (UTC) time of when the coordinates were acquired. The GPS receiver **16** is preferably located on the vehicle transporting the camera **10** or on the camera itself. The GPS data with the position sequences and UTC time information is then transferred to the computer **34** for storing in the trajectory database **36**.

In addition to the position information provided by the GPS receiver **16**, the inertial navigation system **20** also provides acceleration information to the computer **34** for independently deriving the position sequence of the camera **10**. Specifically, the one or more accelerators and gyroscopes in the inertial navigation system **20** monitor the linear and rotational acceleration rates of the camera **10** and transfer the acceleration data to the computer **34**. The computer **34** integrates the acceleration data to obtain the position of the camera **10** as a function of time. The computer **34** preferably combines the position derived from the acceleration information with the GPS position data to produce a more accurate evaluation of the position of the camera **10** at particular instances in time.

The post-processing computer **28** uses the image and position sequences to synthesize the acquired images and create composite images of the location that was filmed. The composite images preferably provide a wider field of view of the location than any single image frame acquired by the camera **10**. In essence, the composite images help provide a panoramic view of the location.

FIG. **2** is an illustration of a composite image **40** created from the image frames **42** acquired by the camera **10** while moving along an x-axis **58** direction. In creating the composite image **40**, the computer assumes a fictitious camera **44** located behind the actual camera **10** and identifies optical rays **46** originating from the fictitious camera. The location of the fictitious camera **44** depends on the desired field of view of the location being filmed. The further away the fictitious camera is placed from the objects along the x-axis **58**, the wider its field of view of the objects.

The computer also identifies optical rays **48** originating from the actual camera **10**. For each optical ray **46** from the fictitious camera **44**, the computer **28** selects an acquired image frame **42** that includes a corresponding optical ray **48** originating from the actual camera **10**. Image data from each selected image frame **42** is then extracted and combined to form the composite image. Preferably, the image data extracted from each image frame is an optical column that consists of a vertical set of pixels. The composite image is preferably created on a column-by-column basis by extracting the corresponding optical column from each image frame. Thus, to create a column P_i **50** in the composite image **40**, the computer locates an image frame **42*a*** that was acquired when the camera **10** was located at X_i **52**. To locate this image frame **42*a***, the computer uses the GPS data and/or data from the inertial navigation system **20** to identify a time T_i **54** at which the camera **10** was in the location X_i **52**. Once the image frame **42*a*** is identified, the computer **28** extracts the optical column **56** with an index $(P_i/N)*M$, where N is the total number of columns in the composite image **40** and M is the number of columns in the image frame **42*a***. The composite image **40** is stored in the image database **32**, preferably in JPEG format, and associated with an identifier identifying the particular geographic location depicted in the image. Furthermore, close-ups and fish-eye views of the objects are also extracted from the video sequences using well-known methods, and stored in the image database **32**. The unused data from the acquired images is then preferably deleted from the computer's memory.

FIG. **3** is a high-level flow diagram of the steps exercised by the data acquisition and processing system in creating and storing the composite images. In step **60**, the camera **10** acquires a series of images of a particular geographic location. At the same time, the GPS receiver **16** and/or inertial navigation system **20** acquires the position of the camera **10** while the images are being acquired. Because the time associated with the position information (position time) is likely to differ from the times of acquisition of the video images (video time), the computer **28**, in step **62**, synchronizes the image sequence with the position sequence. The synchronization is preferably a post-processing step that occurs after the image and position sequences have been acquired.

In step **64**, the computer **28** segments the trajectory taken by the recording camera **10** into multiple segments and labels each segment with identifying information about the segment. For example, if the camera traverses through various streets, the computer **28** segments the trajectory into multiple straight street segments and associates each street segment with a street name and number range. In step **66**, the computer **28** generates a series of composite images depicting a portion of each segment, and in step **68**, stores each composite image in the image database **32** along with the identifying information of the segment with which it is associated.

FIG. **4** is a more detailed flow diagram of step **62** for synchronizing the image sequences with the position sequences of the recording camera according to one embodiment of the invention. Although the process illustrated in FIG. **4** assumes that the position data is GPS data, a person skilled in the art should recognize that a similar process may be employed to synchronize the images to positions calculated using the inertial navigation system **20**.

The process starts, and in step **70**, a user of the system selects a landmark in the image sequence that appears in at least two distinct video frames. This indicates that the landmark was recorded once while the camera **10** was moving on one direction on the path, and again while the

camera was moving in an opposite direction on the same path. The landmark may be, for example, a tree in a lane divider.

In step **72**, a time interval T is measured in the image sequence between the two passings of the landmark. In step **74**, the computer **28** uses the GPS data to compute a function for determining the time interval between successive passes of any point along the path. The function is then used to find, for each point x on the path, a time of return Tr(x) which measures the lapse of time between the two passings of each point. In step **76**, a point is identified for which Tr(x)=T. The identified point provides the GPS position of the landmark and hence, a GPS time associated with the landmark. Given the GPS time, a difference between the GPS time and the video time associated with the landmark may be calculated for synchronizing any image frame acquired at a particular video time to the GPS position of the camera at a particular GPS time.

FIG. **5** is a flow diagram of an alternative embodiment for synchronizing the image sequences with GPS position information. As in FIG. **4**, the process illustrated in FIG. **5** also identifies, in step **80**, a landmark in the image sequence that appears in at least two distinct image frames. In step **82**, a time phase is initialized to an arbitrary value using the camera time stamp. In step **84**, the computer **28** measures the distance traveled between the two points on the path that correspond to the time instants in the image sequence where the landmark is seen from the two sides of the path. In step **86**, an inquiry is made as to whether the distance has been minimized. If the answer is NO, the time phase is modified in step **88**, and the process returns to step **84** where the distance is measured again.

In another embodiment, the synchronization does not occur as a post-production process, but occurs in real-time as the image and position sequences are acquired. FIG. **6** is a block diagram of a portion of the data acquisition and processing system of FIG. **1** allowing a real-time synchronization of image and position data. A UTC clock generator **90** provides to the data acquisition computer **34** the UTC time associated with each GPS position of the recording camera **10** as the camera moves along the path. The video time produced by a camera clock **92** is also provided to the data acquisition computer **34** via the communications port **24**. A UTC card **94** on the computer **34** correlates the video time to the UTC time. Thus, the video image acquired at the video time may be correlated to the GPS position of the camera during the recording of the image.

FIG. **7** is yet another embodiment for synchronizing the image sequences with the GPS position of the recording camera **10**. In step **100**, the post-processing computer **28** computes the temporal variation in the image values (i.e. optical flow) of the bottom pixel rows in the image sequence. Thus, the average velocity of each of the pixels in the row may be obtained. In step **102**, the tangential velocity of the camera **10** is obtained from the GPS reading. The average velocity for the computed pixels is directly proportional to the vehicle tangential velocity. Thus, in step **104**, the time phase between the position and video sequences may be determined as a time delay maximizing the alignment of local maxima and local minima between the average pixel velocity and the vehicle tangential velocity. This time phase is then read out in step **106**.

FIG. **8** is a more detailed flow diagram of step **64** of FIG. **3** for segmenting the trajectory followed by one or more recording cameras **10** and labeling the segments with an identifier. In the one camera scenario, the camera is moved along the path making a right turn at each intersection until a block **112** has been filmed, as is illustrated in FIG. **9**. The camera then moves to a second block **114** to film the objects on that block. Thus, a particular path **110** adjoining the two blocks **112**, **114** is traversed twice on opposite directions allowing the filming of the objects on each side of the path.

In step **120**, the post-processing computer **28** segments the camera's trajectory into straight segments by detecting the points of maximum curvature (i.e. where the turns occur). In this regard, the latitude and longitude coordinates provided by the GPS receiver **16** are converted into two-dimensional Mercator coordinates according to well-known methods. A spline interpolation is then obtained from the two-dimensional Mercator coordinates and the resulting spline function is parameterized in arc-length. The computer **28** obtains a new sampling of the coordinates from the spline function by uniformly sampling the coordinates in an arc-length increment of about one meter while detecting the points in the new sequence where a turn was made. The place where a turn occurs is assumed to be the place of an intersection of two segments.

Preferably, the computer **28** performs a singular value decomposition computation according to well-known methods to detect the turns. In this regard, the computer selects an observation window containing N sample points that is moved along the spline for calculating an index indicative of the overall direction (i.e. alignment) of the points in the window. The higher the index, the less aligned the points, and the more likely that the camera was making a turn at those points. The points are least aligned at the center of a turn, and thus, the computer selects as a turn coordinate a point in the observation window where the index is at a local maximum. The computer **28** gathers all the points whose indexes correspond to local maxima and stores them into an array of turn coordinates.

In step **122**, the computer **28** determines the center of an intersection by grouping the turn coordinates into clusters where turns that belong to the same cluster are turns made on the same intersection. An average of the turn coordinates belonging to the same cluster is then calculated and assigned as the intersection coordinate.

The endpoints of each straight segment are identified based on the calculated intersection coordinates. In this regard, an intersection coordinate at the start of the segment is identified and assigned to the segment as a segment start point (the "From" intersection coordinate). An intersection coordinate at the end of the segment is also identified and assigned to the segment as a segment end point (the "To" intersection coordinate).

In the scenario where at least two side cameras are utilized, each camera films the objects on each side of the path during the first pass on the path. Thus, unlike the single camera scenario where a turn is made at each intersection to move the camera along the same path twice but in opposite directions, a turn is not made at each intersection in the two camera scenario. Therefore, instead of identifying the points of maximum curvature for determining the intersection coordinates, the intersection coordinates are simply detected by tracking the GPS data and identifying where the segments orthogonally intersect.

The computer **28** associates the calculated segments with information obtained from a geographic information database **128** and stores it into a segments table as is described in further detail below. In the scenario where composite images of a city are created, the geographic information database **128** includes a map of the city where the endpoints of each street segment on the map are identified by latitude and longitude information. The database **128** further

includes a street name and number range for each street segment on the map. Such databases are commercially available from third parties such as Navigation Technologies and Etak, Inc.

In correlating the segments of the camera's trajectory with the segments in the geographic information database **128**, the computer, in step **124**, determines the correspondences between the "From" and "To" coordinates calculated for the trajectory segment with intersection coordinates of the segments in the database. The computer **28** selects the segment in the geographic information database **128** which endpoints are closest to the computed "From" and "To" coordinates, as the corresponding segment.

In step **126**, the computer labels each trajectory segment with information that is associated with the corresponding segment in the database **128**. Thus, if each segment in the database **128** includes a street name and number, this information is also associated with the trajectory segment.

FIG. **10** is a more detailed flow diagram of step **66** of FIG. **3** for creating a composite image of a segment of the camera's path according to one embodiment of the invention. In step **130**, the computer **28** computes the arc length coordinate Xc of the center of the segment which is then set as the center of the composite image. In step **132**, the computer identifies the optical rays **46** (FIG. **2**) originating from the fictitious camera **44** by computing an array of equidistant positions X**1**, X**2**, . . . , Xn along the camera's trajectory, centered around Xc. The number of computed positions preferably depend on the number of optical columns that are to be created in the composite image.

In step **134**, the computer **28** uses the position information obtained from the GPS receiver **16** and/or inertial navigation system **20** to map each position Xi on the trajectory to a position time Ti. Thus, if GPS data is used to determine the camera's position, each position Xi of the camera **10** is mapped to a UTC time.

In step **136**, the computer **28** uses the time phase information computed in the synchronization step **62** of FIG. **3** to convert the position times to video times. For each identified video time, the computer **28**, in step **138**, identifies an associated image frame and extracts a column of RGB pixel values from the frame corresponding to the optical rays **46** originating from the fictitious camera **44**. In step **140**, the column of RGB pixel values are stacked side by side to generate a single image bitmap forming the composite image.

FIG. **11** is a more detailed flow diagram of step **138** for identifying and retrieving a column of RGB pixel values for a particular video time Ti according to one embodiment of the invention. In step **150**, the computer **28** identifies an image frame with frame index Fi acquired at time Ti. Because the image frames are acquired at a particular frame rate (e.g. one frame every 1/30 seconds), there may be a particular time Ti for which an image frame was not acquired. In this scenario, the frame closest to time Ti is identified according to one embodiment of the invention.

In step **152**, the current position of the image sequence is set to the image frame with index Fi, and the frame is placed into a frame buffer. In step **154**, a column in the image frame with an index i is read out from the frame buffer.

FIG. **12** is a flow diagram of an alternative embodiment for identifying and retrieving a column of RGB pixel values for a particular video time Ti. If an image frame was not acquired at exactly time Ti, the computer, in step **160**, identifies 2*N image frames that are closest to time Ti, where N>1. Thus, at least two image frames closest to time Ti are identified. In step **162**, the computer computes an

optical flow field for each of the 2*N image frames and in step **164**, infers the column of RGB values for a column i at time Ti. In the situation where only two image frames are used to compute the optical flow, the computer identifies for each pixel in the first image frame a position X**1** and a position time T**1**. A corresponding pixel in the second frame is also identified along with a position X**2** and a position time T**2**. The position X' of each pixel at time Ti is then computed where X'=X**1**+((Ti−T**1**)/(T**2**−T**1**))*(X**2**−X**1**). Given the position of each pixel at time Ti, a new frame that corresponds to time Ti may be inferred. The computer **28** may then extract the column of RGB values from the new frame for a column i.

Preferably, the computer **28** creates multiple composite images at uniform increments (e.g. every 8 meters) along a segment. In the scenario where the composite images are created for street segments, the composite images depict the view of the objects on each side of the street. The composite images are then stored in the image database **28** along with various tables that help organize and associate the composite images with street segment information.

According to one embodiment of the invention, the image database **32** includes composite images of a geographic area which together provide a visual representation of at least the static objects in the entire area. Thus, if the geographic area is a particular city, the composite images depict the city on a street-by-street basis, providing a visual image of the buildings, stores, apartments, parks, and other objects on the streets. The system further includes an object information database with information about the objects being depicted in the composite images. If the geographic area being depicted is a city, the object information database contains information about the structures and businesses on each city street. In this scenario, each record in the object information database is preferably indexed by a city address.

FIG. **13** is an illustration of an exemplary street segments table **170** including the street segments in the camera's trajectory. The table **170** suitably includes multiple entries where each entry is a record specific to a particular street segment. A particular street segment record includes an index identifying the street segment (segment ID) **172** as well as the corresponding street name **174** obtained from the geographic information database **128** (FIG. **12**). A particular street segment record also includes the direction of the street (North, South, East, or West) **176** with respect to a main city street referred to as a city hub. The direction information generally appears in an address in front of the street name. A city, state, and/or country fields may also be added to the table **170** depending on the extent of the geographic area covered in the image database **32**.

A street segment record includes the endpoint coordinates **178** of the corresponding street segment in the geographic information database **128**. An array of segment IDs corresponding to street segments adjacent to the segment start point are identified and stored in field **180** along with the direction in which they lie with respect to the start point (e.g. North, South, East, or West). Similarly, an array of segment IDs corresponding to street segments adjacent to the segment end point are also identified and stored in field **182**. These segments are also ordered along the direction in which they lie.

In addition to the above, a street segment record includes a distance of the start of the trajectory segment from the city hub **184**. The city hub generally marks the origin of the streets from which street numbers and street directions (North, South, East, or West) are determined. Street numbers are generally increased by two at uniform distances (e.g.

every 12.5 feet) starting from the hub. Thus the distance from the hub allows a computation of the street numbers on the street segment. In a one camera situation where each segment is traversed twice, the distance from the hub is computed for each camera trajectory. In a multiple camera scenario, however, only one distance is computed since the camera traverses the segment only once.

Also included in a street segment record is a length of the trajectory segment. Such a length is computed for each trajectory in a one camera **10** scenario because the movement of the camera **10** is not identical during the two traversals of the segment.

Each street segment record **170** further includes an offset value **188** for each side of the street. The offset is used to correct the street numberings computed based on the distance information. Such a computation may not be accurate if, for instance, there is an unusually wide structure on the segment that is erroneously assigned multiple street numbers because it overlaps into the area of the next number assignment. In this case, the offset is used to decrease the street numbers on the segment by the offset value.

FIG. **14** is an illustration of an exemplary image coordinates table **200** for associating the composite images with the street segments in the street segments table **170**. The image coordinates table **200** includes a plurality of composite image records where each record includes a segment ID **202** of the street segment being depicted in the composite image. In addition, each composite image record includes information of the side of the street segment **204** being depicted. For example, the side may be described as even or odd based on the street numbers on the side of the street being depicted. Each composite image entry also includes a distance from the segment origin to the center Xc of the composite image **206** indicating the position along the street segment for which the image was computed. The distance information is used to retrieve an appropriate composite image for each position on the street segment.

FIG. **15** is an illustration of an exemplary segment block table **210** for allowing an efficient determination of a segment ID that is closest to a particular geographic coordinate. In this regard, the geographic area depicted in the image database **32** is preferably partitioned into a grid of square blocks where each block includes a certain number of street segments. The blocks are assigned block labels preferably corresponding to the center longitude and latitude coordinates of the block. The block labels are stored in a block label field **212**. Associated with each block label are segment IDs **214** corresponding to the street segments in the block. Given the coordinates of a particular geographic location, the block closest to the given coordinates may be identified to limit the search of street segments to only street segments within the block.

In a particular use of the system, a user places inquiries about a location in a geographic area depicted in the image database **32**. For example, the user may enter an address of the location, enter the geographic coordinates of the location, select the location on a map of the geographic area, or specify a displacement from a current location. Preferably, the user has access to a remote terminal that communicates with a host computer to service the user requests. The host computer includes a processor programmed with instructions to access the image database **32** in response to a user request and retrieve composite images about the particular location. The processor is also programmed with instructions to access the geographic and object information databases to retrieve maps and information on the businesses in the geographic area. The retrieved data is then transmitted to the requesting remote user terminal for display thereon.

The remote user terminals may include personal computers, set-top boxes, portable communication devices such as personal digital assistants, and the like. The visual component of each remote user terminal preferably includes a VGA or SVGA liquid-crystal-display (LC) screen, an LED display screen, or any other suitable display apparatus. Pressure sensitive (touch screen) technology may be incorporated into the display screen so that the user may interact with the remote user terminal by merely touching certain portions of the screen. Alternatively, a keyboard, keypad, joystick, mouse, and/or remote control unit is provided to define the user terminal's input apparatus.

Each remote user terminal includes a network interface for communicating with the host computer via wired or wireless media. Preferably, the communication between the remote user terminals and the host computer occurs over a wide area network such as the Internet.

In an alternative embodiment of the invention, the image, geographic information, and object information databases reside locally at the user terminals in a CD, DVD, hard disk drive, or any other type of mass storage media. In this embodiment, the user terminals include a processor programmed with instructions to receive queries from the user about a particular geographic location and retrieve composite images and associated information in response to the user queries.

FIG. **16** is an illustration of an exemplary graphical user interface (GUI) for allowing the user to place requests and receive information about particular geographic locations. The GUI includes address input fields **220** allowing the user to enter the street number, street name, city and state of the particular location he or she desires to view. Actuation of a "See It" button **222** causes the user terminal to transmit the address to the host computer to search the image and geographic location databases **32**, **128** for the composite image and map corresponding to the address. Furthermore, the host computer searches the object information database to retrieve information about the objects depicted in the composite image.

The retrieved composite image and map are respectively displayed on the display screen of the requesting user terminal in a map area **226** and an image area **224**. The map is preferably centered around the requested address and includes a current location cursor **228** placed on a position corresponding to the address. The current location identifier **228** may, for instance, take the shape of an automobile.

The composite image displayed on the image area **224** provides a view of a side of the street (even or odd) based on the entered street number. The user may obtain information about the objects being visualized in the composite image by actuating one of the information icons **234** above the image of a particular object. In displaying the information icons **234**, a range of street addresses for the currently displayed image is computed. The listings in the object information database with street numbers that fall inside the computed range are then selected and associated with the information icons **234** displayed on top of the image of the object.

If the objects are business establishments, the information displayed upon actuating the information icons **234** may include the name, address, and phone number **236** of the establishment. This information is preferably displayed each time the user terminal's cursor or pointing device is passed above the icon. In addition, if the establishment is associated with a particular Web page, the information icon **234** func-

tions as a hyperlink for retrieving and displaying the Web page, preferably on a separate browser window.

The user may obtain a close-up view of a particular object in the composite image by selecting the object in the image. A close-up view of the object is then obtained by computing the distance of the selected object from the origin of the street segment where they object lies. The location on the segment of the closest close-up image is computed and retrieved from the image database **32**. The close-up image is then provided in the image area **224** or in a separate browser window.

A "Switch View" button **230** allows the user to update the current composite image providing a view of one side of the street with a composite image of the other side of the street. In a multiple camera scenario, each actuation of the "Switch View" button **230** provides a different view of the street. The current view is preferably identified by a direction identifier (not shown) on or close to the current location identifier **228**. For instance, one side of the current location identifier **228** may be marked with a dot or an "X" to identify the side of the street being viewed. Alternatively, an arrow may be placed near the current location identifier **228** to identify the current viewing direction.

The composite image is also updated as the user navigates through the streets using the navigation buttons **232**. From a current location, the user may choose to navigate north, south, west, and east by actuating the corresponding buttons. Preferably, only the navigation buttons corresponding to the possible direction of motions from the current position are enabled. As the user actuates one of the buttons, the current position is incremented by a predetermined amount, currently set to eight meters, to the next available composite image on the current or adjacent segment. The image area **224** is then updated with the new composite image.

FIG. **17** is a flow diagram of the process executed by the host computer for obtaining image and location information of an express street address entered in the address input fields **220**. A similar process is executed by the user terminal in the embodiment where the location and image information are stored locally at the user terminal.

The process starts, and in step **240**, the user requests information about a particular street address by entering the address in the address input fields **220**. In step **242**, the address is transmitted to the host computer preferably over a wide area network such as the Internet. In step **244**, a query is run on the host computer to locate the street segment index in the street segment table **170** (FIG. **13**) corresponding to the requested address. In this regard, the computer searches the street segment table **170** for street segments that match the desired street name **174** as well as a city, state, or country if applicable. For each street segment matching the street name, the computer computes the starting street number on that segment preferably based on the following formula:

Start Number=(round((Distance from Hub+Offset)/K)*2)

The distance from the hub **184** and offset **188** values are obtained from the street segment table **170**. The value K is the distance assumed between any two street numbers on the segment.

The ending street number on the street segment is also calculated using a similar formula:

End Number=(round((Distance from Hub+Offset+length)/K)*2)

The length is the length **186** value obtained from the street segment table **170**.

Once the start and end street numbers are calculated for a particular street segment, the computer determines whether the requested street number lies within the start and end street numbers. If it does, the computer returns the corresponding segment ID **172**. Furthermore, the computer determines the distance of the requested street number from the start of the street segment for determining the position of the street number on the street segment.

In step **246**, the host computer transmits the query result to the requesting user terminal along with a map of the input location retrieved from the geographic information database **128**. In step **248**, the requesting user terminal downloads from the host computer a record from the street segments table **170** corresponding to the identified street segment. Furthermore, the user terminal also retrieves the computed start and end street numbers of the street segment, a list of computed composite images for both sides of the street segment in the image coordinates table **200** (FIG. **14**), and information of the objects visible on the street segment in the object information database.

In step **250**, the user terminal downloads a composite image for the appropriate side of the street from the host computer that has a distance from the origin of the street segment to the center of the composite image **206** (FIG. **14**) that is closest to the distance of the desired street number from the origin. The display on the user terminal is then updated in step **252** with the new location and image information.

FIG. **18** is a flow diagram of the process executed by the host computer for obtaining image and location information of a particular location selected on the map displayed in the map area **226**. A similar process is executed by the user terminal in the embodiment where the location and image information are stored locally at the user terminal.

The process starts, and in step **260**, the user requests information about a particular street address by selecting a location on the map. In step **262**, the map coordinates are converted from screen coordinates to geographic location coordinates (x,y) and transmitted to the host computer preferably over the Internet. In step **244**, a query is run on the host computer to locate the street segment index in the street segment table **170** (FIG. **13**) corresponding to the geographic location coordinates. In this regard, the computer searches the segment block table **210** (FIG. **15**) for a block that includes the street segment corresponding to the input location. In order to locate such a block, the computer rounds the identified geographic location coordinates based preferably on the size of the block. The rounded (x,y) coordinates may thus be represented by ((round (x/B))*B, (round y/B)*B)), where B is the length of one of the block sides. The computer then compares the rounded number to the coordinates stored in the block label field **212** and selects the block with the label field **212** equal to the rounded coordinate. Once the appropriate block is identified, the computer proceeds to retrieve the segment IDs **214** associated with the block. The geographic coordinates of the desired location are then compared with the endpoint coordinates of each street segment in the block for selecting the closest street segment.

In step **266**, the segment ID of the closest street segment is returned to the user terminal. Additionally, a new map of the desired location may be transmitted if the previous map was not centered on the desired location.

In step **268**, the requesting user terminal downloads from the host computer a street segment record in the street segments table **170** corresponding to the identified street segment. The user terminal also retrieves the calculated start

and end street numbers of the street segment, a list of computed composite images for both sides of the street the segment in the image coordinates table **200** (FIG. **14**), and information of the objects visible on the street segment in the object information database.

In step **270**, the user terminal downloads the composite image corresponding to the geographic coordinates of the input location. To achieve this, the geographic coordinates are converted to a distance along the identified street segment. The user terminal downloads a composite image that has a distance from the origin of the street segment to the center of the composite image **206** (FIG. **14**) that is closest to the distance of the input location from the origin. The display on the user terminal is then updated in step **272** with the new location and image information.

Although this invention has been described in certain specific embodiments, those skilled in the art will have no difficulty devising variations which in no way depart from the scope and spirit of the present invention. For example, the composite images may be made into streaming video by computing the composite images at small increments along the path (e.g. every 30 cm). Furthermore, the composite images may be computed at several resolutions by moving the fictitious camera **44** (FIG. **2**) closer or further away from the path to decrease or increase its field of view and provide the user with different zoom levels of the image.

Variation may also be made to correct any distortions in the perspective of the composite image along the vertical y-axis direction. The extraction of the optical columns from the acquired image frames may introduce such a distortion since the sampling technique used along the horizontal x-axis direction is not applied along the y-axis. Such a distortion may be corrected by estimating the depth of each pixel in the composite image using optical flow. The aspect ratio of each pixel may be adjusted based on the distance of the object visualized in the pixel. The distortion may also be corrected by acquiring images from an array of two or more video cameras **10** arranged along the vertical y-axis in addition to the cameras in the horizontal axis.

The described method of generating composite images also relies on an assumption that the camera's trajectory is along a straight line. If this is not the case and the vehicle carrying the camera makes a lane change, makes a turn, or passes over a bump, the choice of the optical column extracted from a particular image frame may be incorrect. The distortion due to such deviations from a straight trajectory may, however, be corrected to some degree using optical flow to detect such situations and compensate for their effect.

It is therefore to be understood that this invention may be practiced otherwise than is specifically described. Thus, the present embodiments of the invention should be considered in all respects as illustrative and not restrictive, the scope of the invention to be indicated by the appended claims and their equivalents rather than the foregoing description.

What is claimed is:

1. In a system including an image source and a user terminal having a screen and an input device, a method for enabling visual navigation of a geographic area from the user terminal, the method comprising:

receiving a first user input specifying a first location in the geographic area;

retrieving from the image source a first image associated with the first location, the image source providing a plurality of images depicting views of objects in the geographic area, the views being substantially elevations of the objects in the geographic area, wherein the images are associated with image frames acquired by an image recording device moving along a trajectory;

receiving a second user input specifying a navigation direction relative to the first location in the geographic area;

determining a second location based on the user specified navigation direction; and

retrieving from the image source a second image associated with the second location.

2. The method of claim **1**, wherein image source resides at a remote site and receives a request via a communications network for an image corresponding to the first or second location, and transmits the retrieved image to the user terminal via the communications network.

3. The method of claim **1**, wherein the image source resides at the user terminal and the method further comprises:

displaying the image corresponding to the first location on the screen of the user terminal; and

updating the image on the screen with the image corresponding to the second location.

4. The method of claim **1** further comprising retrieving a map of a portion of the geographic area for displaying the map on the screen of the user terminal.

5. The method of claim **4** further comprising:

displaying an icon on the map associated with an object in the portion of the geographic area covered by the map;

receiving a user selection of the icon; and

identifying the second location based on the user selection.

6. The method of claim **4**, wherein the first or second location is identified by a user selection of the location on the map using the input device.

7. The method of claim **1**, wherein the first location is identified by a specific address entered by the user using the input device.

8. The method of claim **1**, wherein the retrieving of the image corresponding to the first or second location comprises:

identifying a street segment including the first or second location;

identifying a position on the street segment corresponding to the first or second location; and

identifying an image associated with said position.

9. The method of claim **8**, wherein the image simulates a view of objects on one side of the street segment and the method further comprises retrieving a second image depicting a view of objects on an opposite side of the street segment in response to a user request.

10. The method of claim **1** further comprising:

receiving a user selection of a portion of the image; and

displaying an alternate view of the selected portion.

11. The method of claim **1** further comprising:

displaying an indicia that information is available about an object in the image; and

retrieving information about the object in response to a user request to display the information on the screen of the user terminal.

12. The method of claim **1** further comprising:

displaying a navigation button on the screen of the user terminal; and

retrieving the image associated with the second location from the image source upon actuation of the navigation button using the user input device.

13. The method of claim **12**, wherein the navigation button indicates direction of motion within a displayed map.

14. The method of claim **12**, wherein the navigation button indicates direction of motion with respect to the displayed image.

15. The method of claim **14**, wherein the direction of motion includes one of panning left or right, rotating left or right, and viewing a direction opposite of a displayed direction.

16. The method of claim **1** further comprising:

displaying a map of a portion of the geographic area;

identifying the first location with an identifier on the map; and

advancing the identifier on the map from the first location to the second location.

17. The method of claim **1**, wherein the plurality of images are substantially frontal views of the objects within the geographic area.

18. The method of claim **1**, wherein the image source is an image database.

19. In a system including an image source and a user terminal having a screen and an input device, a method for enabling visual navigation of a geographic area from the user terminal, the method comprising:

accessing a plurality of images from the image source, the images representing objects within the geographic area;

identifying a current location in the geographic area;

retrieving from the image source an image corresponding to the current location;

monitoring a change of the current location in the geographic area; and

retrieving from the image source an image corresponding to the changed location, wherein each retrieved image is a composite image created by processing a plurality of image frames acquired from an image recording device moving through the geographic area.

20. A system for enabling visual navigation of a geographic area from a user terminal, the system comprising:

means for accessing an image source providing a plurality of images depicting views of objects in the geographic area, the views being substantially elevations of the objects in the geographic area, wherein the images are associated with image frames acquired by an image recording device moving along a trajectory;

means for receiving a first user input specifying a first location in the geographic area;

means for retrieving from the image source a first image associated with the first location;

means for receiving a second user input specifying a navigation direction relative to the first location in the geographic area;

means for determining a second location based on the user specified navigation direction; and

means for retrieving from the image source a second image associated with the second location.

21. The system of claim **20**, wherein the image source resides at a remote site and includes means for receiving a request for an image corresponding to the first or second location, and means for transmitting the retrieved image to the user terminal.

22. The system of claim **20**, wherein the image source resides at the user terminal and the system further comprises:

a display screen for displaying the image of the first location; and

means for updating the image on the screen with the image corresponding to the second location.

23. The system of claim **20** further comprising means for retrieving a map of a portion of the geographic area for displaying the map on the screen of the user terminal.

24. The system of claim **23** further comprising:

means for displaying an icon on the map associated with an object in the portion of the geographic area covered by the map;

means for receiving a user selection of the icon; and

means for identifying the second location based on the user selection.

25. The system of claim **23**, wherein the first or second location is identified by a user selection of a portion of the map.

26. The system of claim **20**, wherein the first location is identified by a specific address entered by the user using an input device.

27. The system of claim **20**, wherein the means for retrieving the image corresponding to the first or second location comprises:

means for identifying a street segment including the first or second location;

means for identifying a position on the street segment corresponding to the first or second location; and

means for identifying an image associated with said position.

28. The system of claim **27**, wherein the image simulates a view of objects on one side of the street segment and the system further comprises means for retrieving a second image depicting a view of objects on an opposite side of the street segment in response to a user request.

29. The system of claim **20** further comprising means for processing a plurality of image frames acquired from the image recording device moving through the geographic area.

30. The system of claim **20** further comprising:

means for receiving a user selection of a portion of the image; and

a display displaying an alternate view of the selected portion.

31. The system of claim **20** further comprising:

means for indicating that information is available about an object in the image;

means for retrieving information about the object in response to a user request to display the information on the screen of the user terminal.

32. The system of claim **20** further comprising:

a navigation button indicating the navigation direction.

33. The system of claim **32**, wherein the navigation button indicates the navigation direction within a displayed map.

34. The system of claim **32**, wherein the navigation button indicates the navigation direction with respect to the displayed image.

35. The system of claim **34**, wherein the navigation direction includes one of panning left or right, rotating left or right, and viewing a direction opposite of a displayed direction.

36. The system of claim **20** further comprising:

means for displaying a map of a portion of the geographic area;

means for identifying the first location on the map; and

means for identifying the second location on the map based on the user-selected navigation direction.

37. The system of claim **20**, wherein the plurality of images are substantially frontal views of the objects within the geographic area.

38. In a system including an image database and a user terminal having a screen and an input device, a method for

enabling visual navigation of a geographic area from the user terminal, the method comprising:

receiving a first user input specifying a first location in the geographic area;

retrieving from the image database a first set of image frames associated with the first location, the image database storing a plurality of image frames depicting views of objects in the geographic area, the views being substantially elevations of the objects in the geographic area, wherein the image frames are acquired by an image recording device moving along a trajectory;

generating a first image of the first location based on the first set of image frames;

receiving a second user input specifying a navigation direction relative to the first location in the geographic area;

determining a second location based on the user specified navigation direction;

retrieving from the image database a second set of image frames associated with the second location; and

generating a second image of the second location based on the second set of image frames.

* * * * *

UNITED STATES PATENT AND TRADEMARK OFFICE

CERTIFICATE OF CORRECTION

PATENT NO. : 7,239,760 B2
APPLICATION NO. : 11/130004
DATED : July 3, 2007
INVENTOR(S) : Enrico Di Bernardo

It is certified that error appears in the above-identified patent and that said Letters Patent is hereby corrected as shown below:

On the Title Page, item

(76) Inventors, lines 1-2	Delete “783 N. Craig Ave., Pasadena, (CA) (US) 91104”, Insert --835 E. Meda Avenue, Glendora, CA (US) 91741--
(76) Inventors, lines 3-4	Delete “1133 Pine St. #109, South Pasadena, CA (US) 91030”, Insert --273 Waverly Drive, Pasadena, CA (US) 91105--

Title page, item (57)

ABSTRACT, line 1	After “method”, Insert --for--
(57) ABSTRACT, line 2	Delete “provide”, Insert --provides--

In the Drawings

Fig. 16, Sheet 16 of 18	Delete Drawing Sheet 16 of 18 and substitute therefore the Drawing Sheet, consisting of Fig. 16, as shown on the attached page

In the Specification

Column 3, line 50	Delete “on”, Insert --an--
Column 4, line 66	Delete “A front”, Insert --Front--
Column 15, line 2	After “street”, Insert --,--

In the Claims

Column 16, line 10, Claim 2	After “wherein”, Insert --the--
Column 16, line 36, Claim 7	Delete “the user”, Insert --a user--

UNITED STATES PATENT AND TRADEMARK OFFICE

CERTIFICATE OF CORRECTION

PATENT NO. : 7,239,760 B2
APPLICATION NO. : 11/130004
DATED : July 3, 2007
INVENTOR(S) : Enrico Di Bernardo

It is certified that error appears in the above-identified patent and that said Letters Patent is hereby corrected as shown below:

Column 16, line 46, Claim 9	After “image”, Insert --associated with said position--
Column 16, line 48, Claim 9	Delete “a second image”, Insert --an image--
Column 16, line 52, Claim 10	Delete “the image”, Insert --the first or second image--
Column 16, line 56, Claim 11	Delete “the image”, Insert --the first or second image--
Column 16, line 65, Claim 12	Delete “user”
Column 17, lines 2-3, Claim 14	Delete “to the displayed image”, Insert --to a displayed image--
Column 18, line 3, Claim 23	Delete “the screen”, Insert --a screen--
Column 18, line 15, Claim 26	Delete “the user”, Insert --a user--
Column 18, line 26, Claim 28	After “image”, Insert --associated with said position--
Column 18, lines 28-29, Claim 28	Delete “retrieving a second image”, Insert --retrieving an image--
Column 18, lines 36-37, Claim 30	Delete “the image”, Insert --the first or second image--
Column 18, line 42, Claim 31	Delete “the image”, Insert --the first or second image--
Column 18, line 45, Claim 31	Delete “the screen”, Insert --a screen--

UNITED STATES PATENT AND TRADEMARK OFFICE

CERTIFICATE OF CORRECTION

PATENT NO. : 7,239,760 B2
APPLICATION NO. : 11/130004
DATED : July 3, 2007
INVENTOR(S) : Enrico Di Bernardo

It is certified that error appears in the above-identified patent and that said Letters Patent is hereby corrected as shown below:

Column 18, lines 51-52, Claim 34	Delete "to the displayed image", Insert --to a displayed image--
Column 18, line 62, Claim 36	Delete "user-selected navigation direction", Insert --user-specified navigation direction--

Signed and Sealed this

Fourth Day of August, 2009

John Doll

JOHN DOLL
Acting Director of the United States Patent and Trademark Office

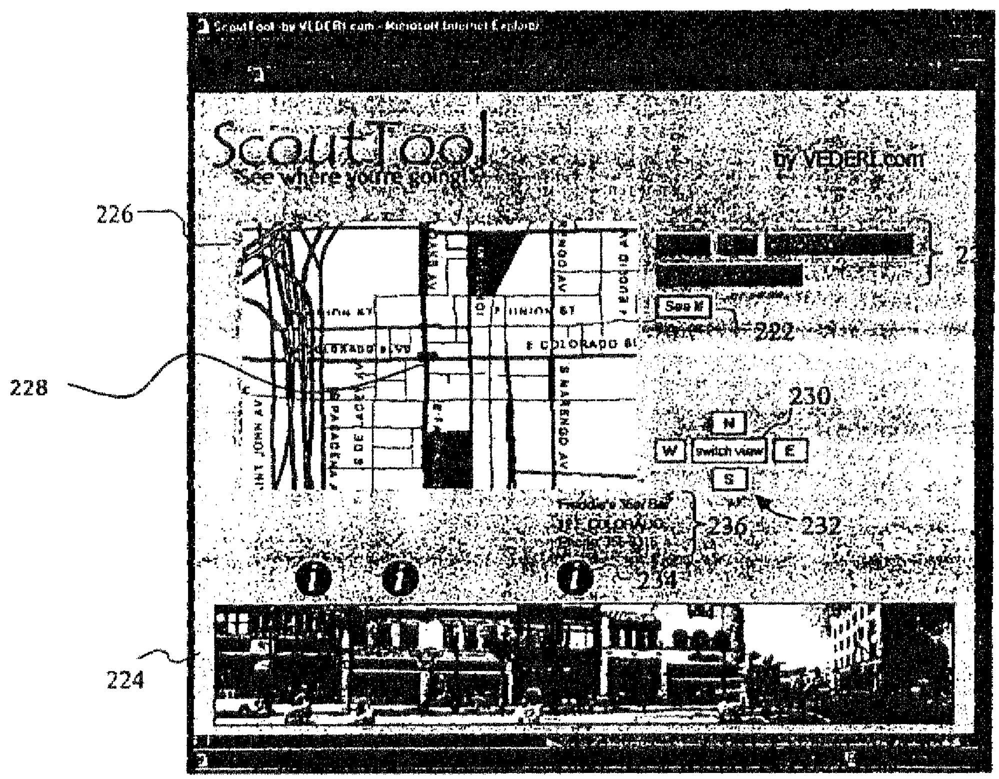
ScoutTool
See where you're going!
by VEDERI.com
See It
switch view
N
W
E
S
226
228
224
222
230
232
234
236

Fig.16

US007577316B2

(12) **United States Patent**
Di Bernardo et al.

(10) **Patent No.: US 7,577,316 B2**
(45) **Date of Patent: *Aug. 18, 2009**

(54) **SYSTEM AND METHOD FOR CREATING, STORING AND UTILIZING IMAGES OF A GEOGRAPHIC LOCATION**

(75) Inventors: **Enrico Di Bernardo**, Pasadena, CA (US); **Luis F. Goncalves**, South Pasadena, CA (US)

(73) Assignee: **Vederi, LLC**, Pasadena, CA (US)

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 0 days.

This patent is subject to a terminal disclaimer.

(21) Appl. No.: **11/761,361**

(22) Filed: **Jun. 11, 2007**

(65) **Prior Publication Data**

US 2007/0299604 A1 Dec. 27, 2007

Related U.S. Application Data

(60) Continuation of application No. 11/130,004, filed on May 16, 2005, now Pat. No. 7,239,760, which is a division of application No. 09/758,717, filed on Jan. 11, 2001, now Pat. No. 6,895,126.

(60) Provisional application No. 60/238,490, filed on Oct. 6, 2000.

(51) **Int. Cl.**
G06K 9/60 (2006.01)
G08G 1/123 (2006.01)
H04N 7/00 (2006.01)
G01C 21/00 (2006.01)

(52) **U.S. Cl.** **382/305**; 340/995.1; 348/113; 701/200

(58) **Field of Classification Search** 382/104, 382/113, 291, 305, 312; 715/850, 851, 854, 715/855; 701/200–215; 340/995.1–995.26; 342/357.12, 357.13
See application file for complete search history.

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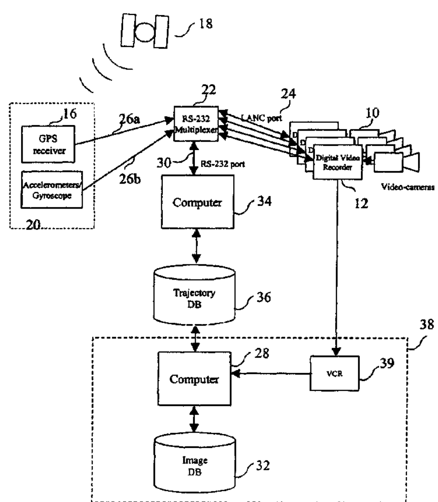
Primary Examiner—Kanji Patel
(74) *Attorney, Agent, or Firm*—Christie, Parker & Hale, LLP

(57) **ABSTRACT**

A system and method synthesizing images of a locale to generate a composite image that provide a panoramic view of the locale. A video camera moves along a street recording images of objects along the street. A GPS receiver and inertial navigation system provide the position of the camera as the images are being recorded. The images are indexed with the position data provided by the GPS receiver and inertial navigation system. The composite image is created on a column-by-column basis by determining which of the acquired images contains the desired pixel column, extracting the pixels associated with the column, and stacking the columns side by side. The composite images are stored in an image database and associated with a street name and number range of the street being depicted in the image. The image database covers a substantial amount of a geographic area allowing a user to visually navigate the area from a user terminal.

35 Claims, 18 Drawing Sheets



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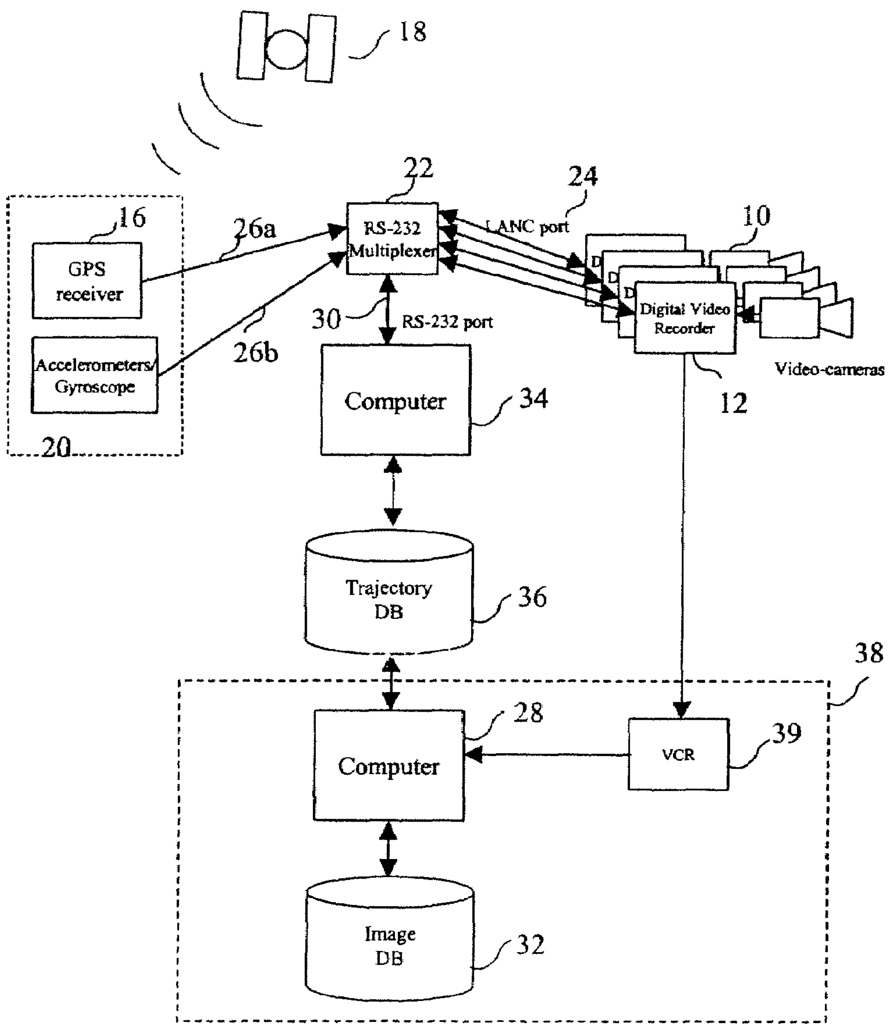

18
22
24
16
26a
RS-232
Multiplexer
LANC port
10
GPS
receiver
30
RS-232 port
Digital Video
Recorder
Accelerometers/
Gyroscope
26b
Video-cameras
Computer
34
12
20
Trajectory
DB
36
38
28
Computer
VCR
39
Image
DB
32

Fig. 1

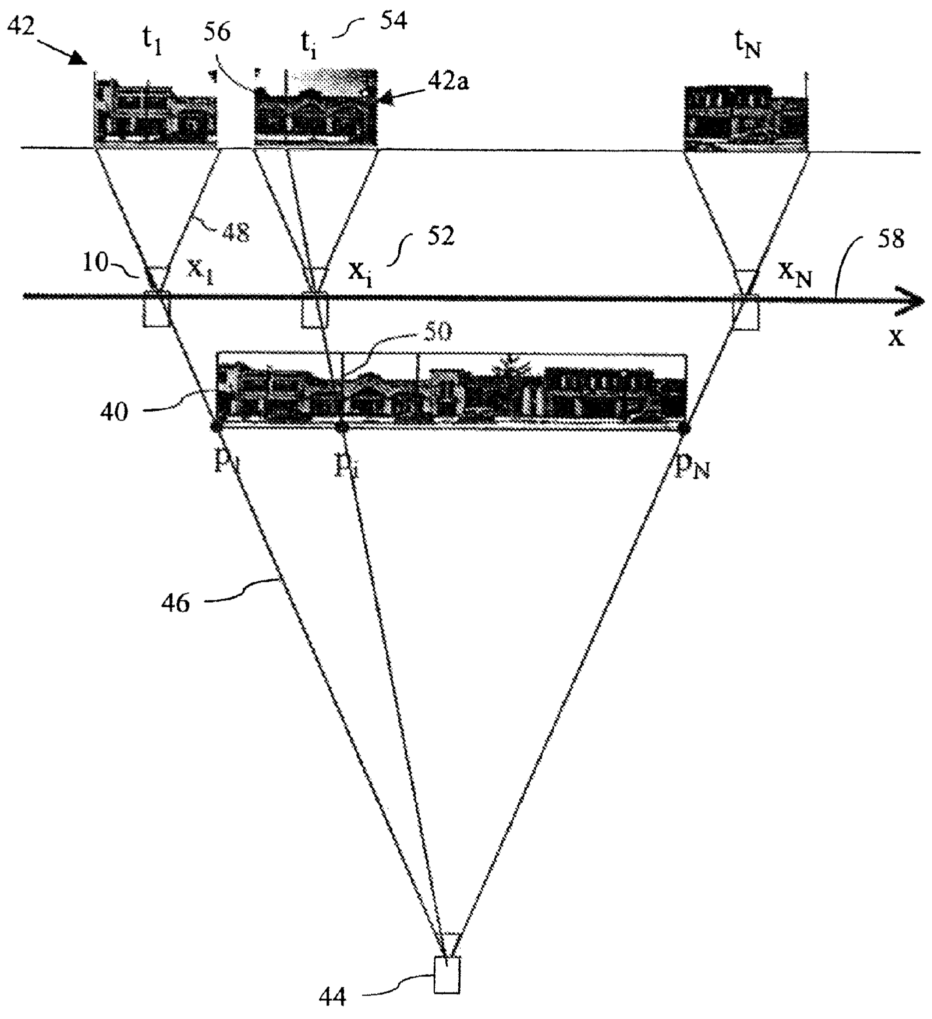


Fig.2

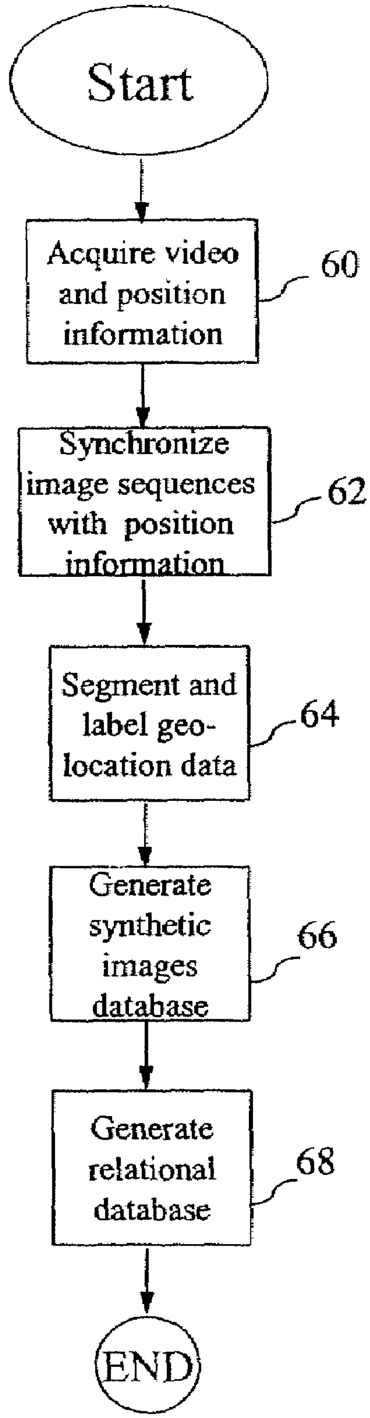

Start
Acquire video and position information
60
Synchronize image sequences with position information
62
Segment and label geo-location data
64
Generate synthetic images database
66
Generate relational database
68
END

Fig.3

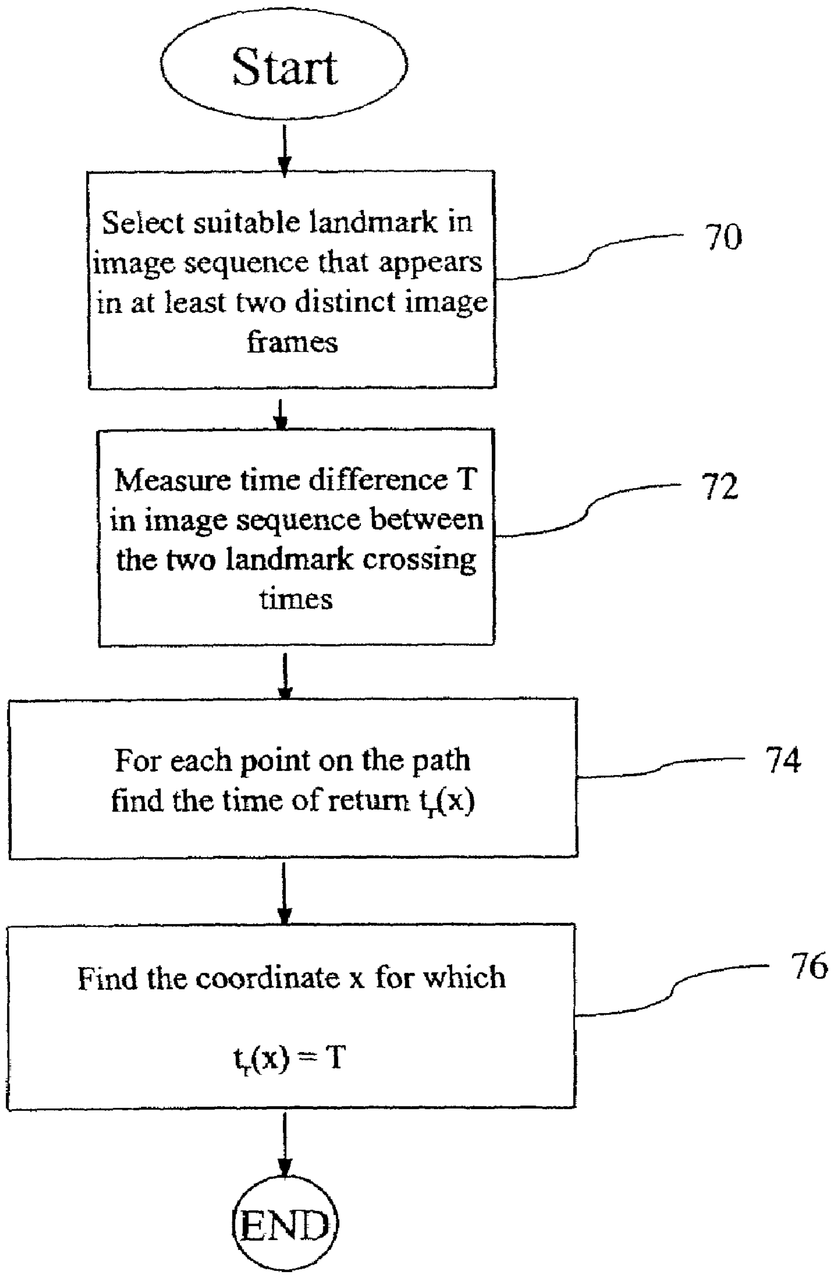

Start
Select suitable landmark in image sequence that appears in at least two distinct image frames
70
Measure time difference T in image sequence between the two landmark crossing times
72
For each point on the path find the time of return $t_r(x)$
74
Find the coordinate x for which
$t_r(x) = T$
76
END

Fig.4

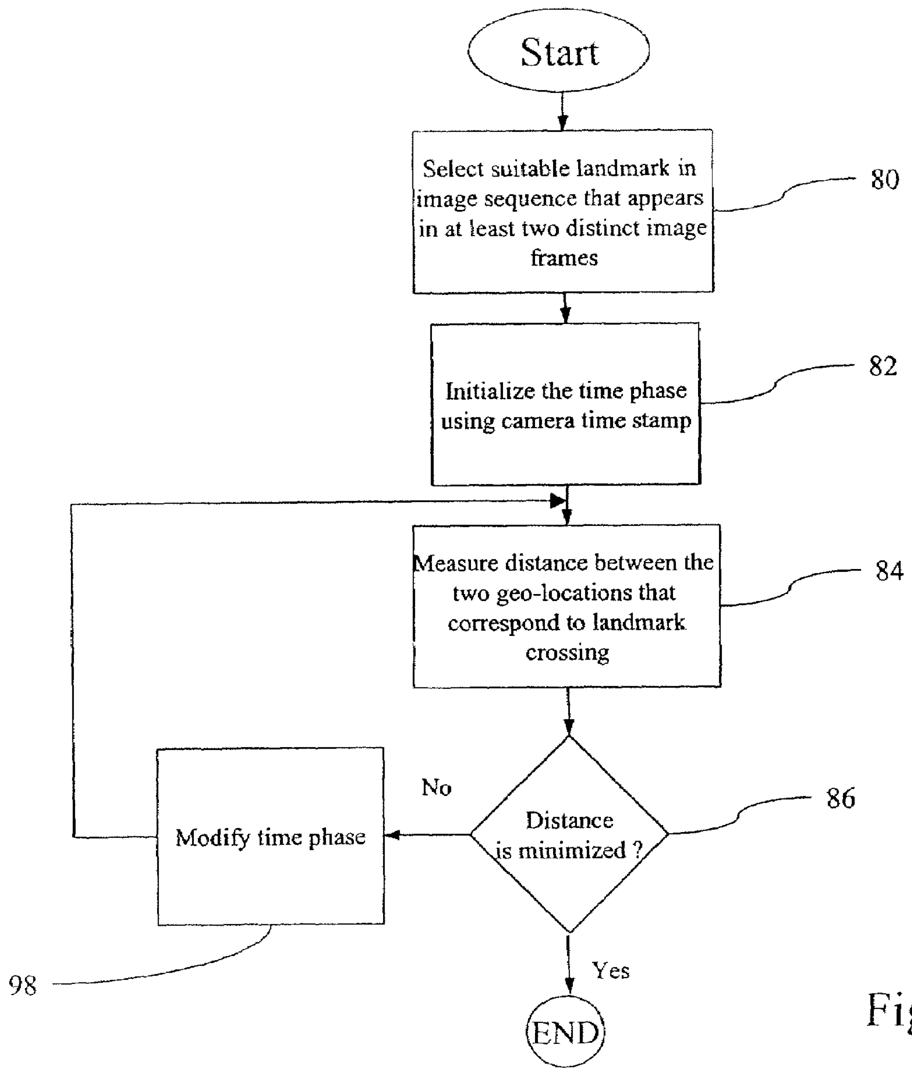
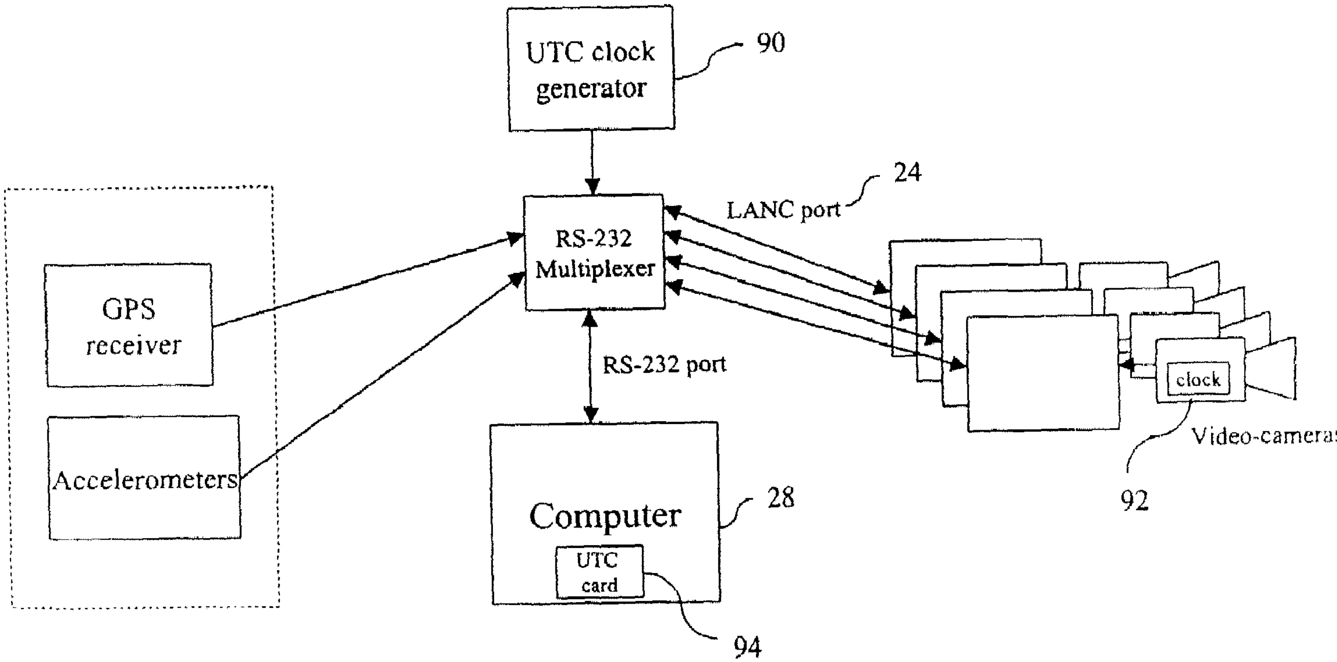

Start
Select suitable landmark in image sequence that appears in at least two distinct image frames
80
Initialize the time phase using camera time stamp
82
Measure distance between the two geo-locations that correspond to landmark crossing
84
Distance is minimized ?
86
No
Modify time phase
98
Yes
END

Fig.5



UTC clock generator
90
RS-232 Multiplexer
LANC port
24
GPS receiver
Accelerometers
RS-232 port
Computer
UTC card
28
94
clock
Video-cameras
92

Fig.6

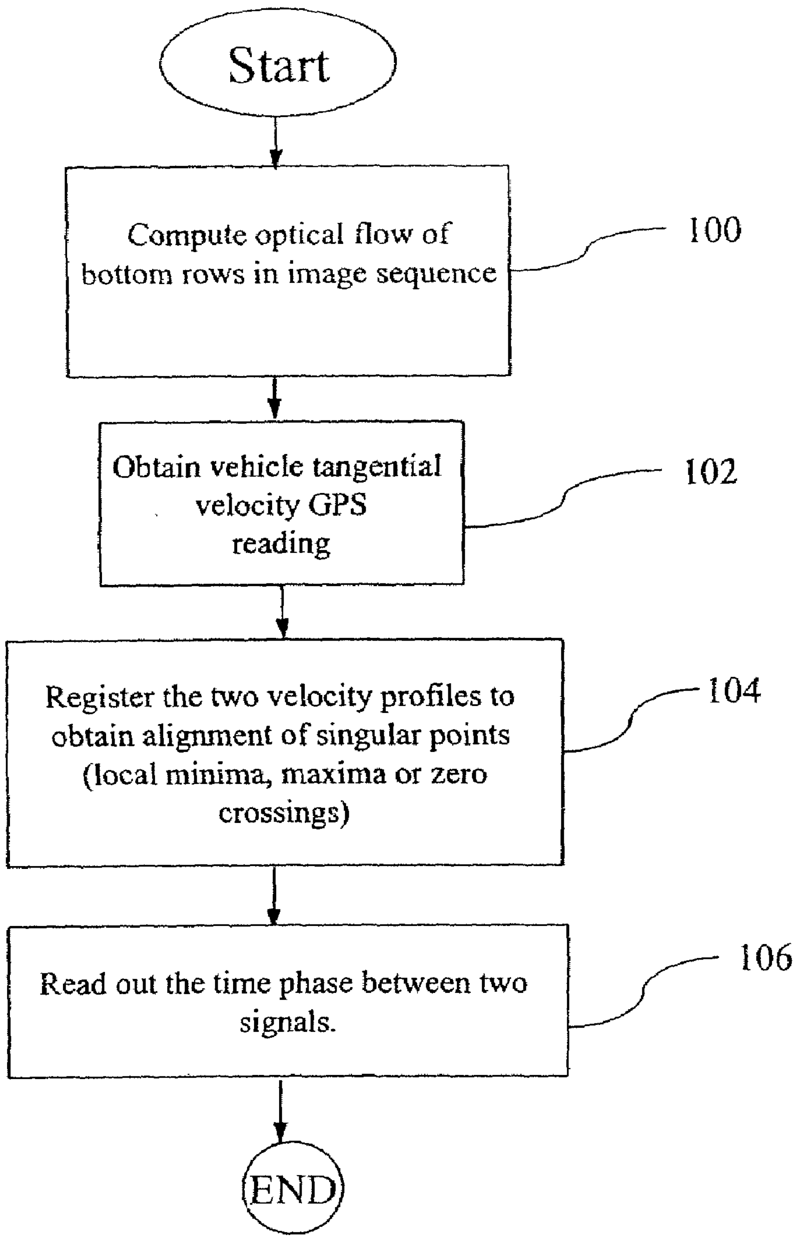

Start
Compute optical flow of bottom rows in image sequence
100
Obtain vehicle tangential velocity GPS reading
102
Register the two velocity profiles to obtain alignment of singular points (local minima, maxima or zero crossings)
104
Read out the time phase between two signals.
106
END

Fig.7

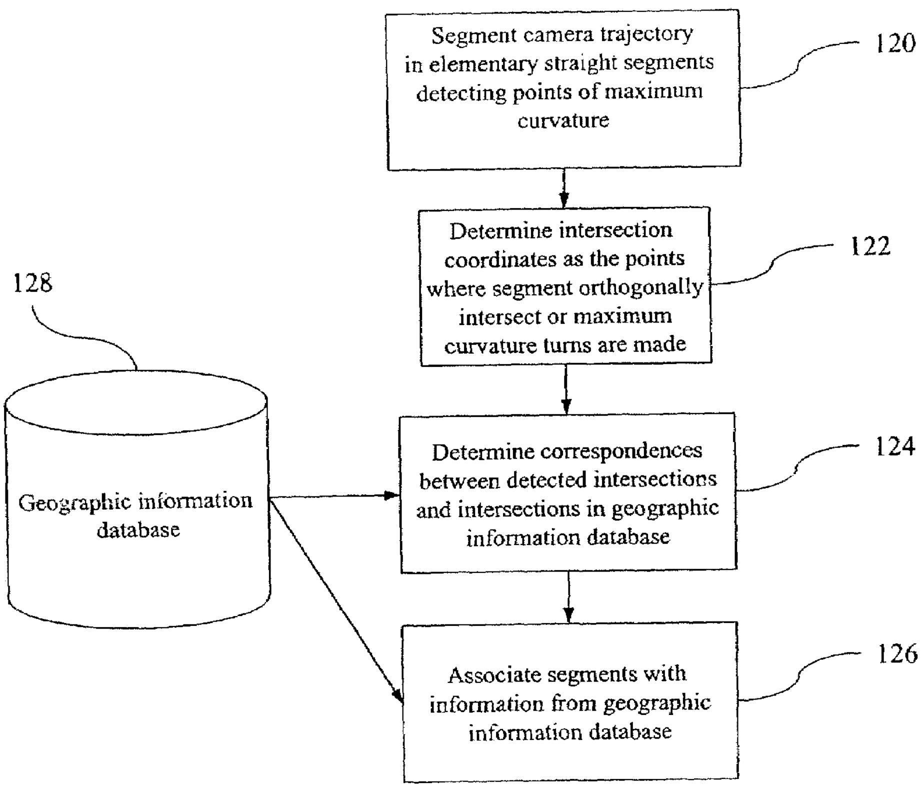

Segment camera trajectory in elementary straight segments detecting points of maximum curvature
120
Determine intersection coordinates as the points where segment orthogonally intersect or maximum curvature turns are made
122
128
Geographic information database
Determine correspondences between detected intersections and intersections in geographic information database
124
Associate segments with information from geographic information database
126

Fig.8

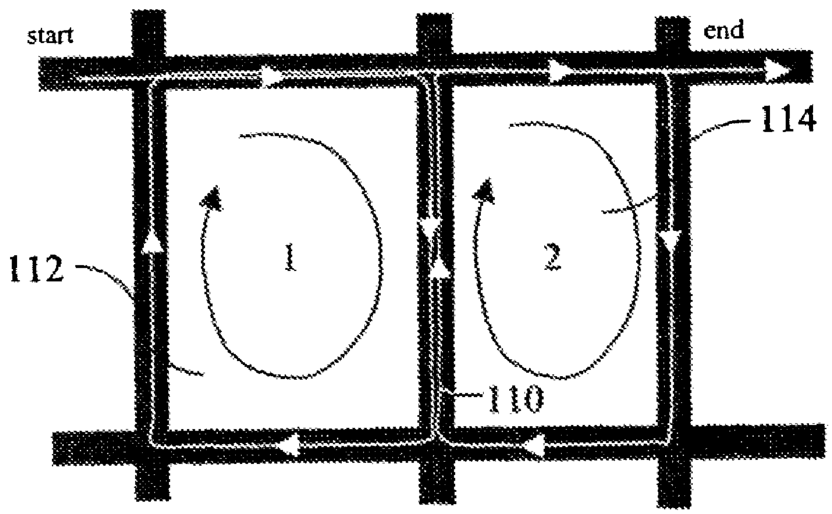
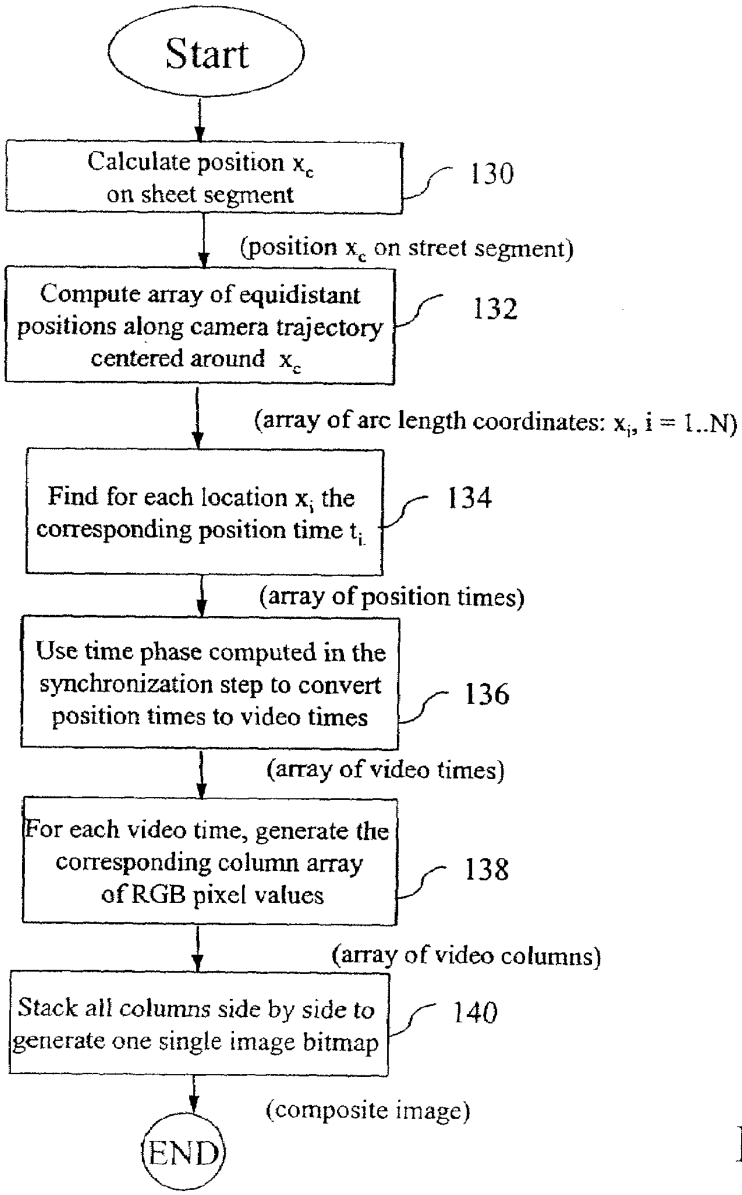


Fig.9



Start
Calculate position x_c on sheet segment
130
(position x_c on street segment)
Compute array of equidistant positions along camera trajectory centered around x_c
132
(array of arc length coordinates: x_i, i = 1..N)
Find for each location x_i the corresponding position time t_i
134
(array of position times)
Use time phase computed in the synchronization step to convert position times to video times
136
(array of video times)
For each video time, generate the corresponding column array of RGB pixel values
138
(array of video columns)
Stack all columns side by side to generate one single image bitmap
140
(composite image)
END

Fig.10

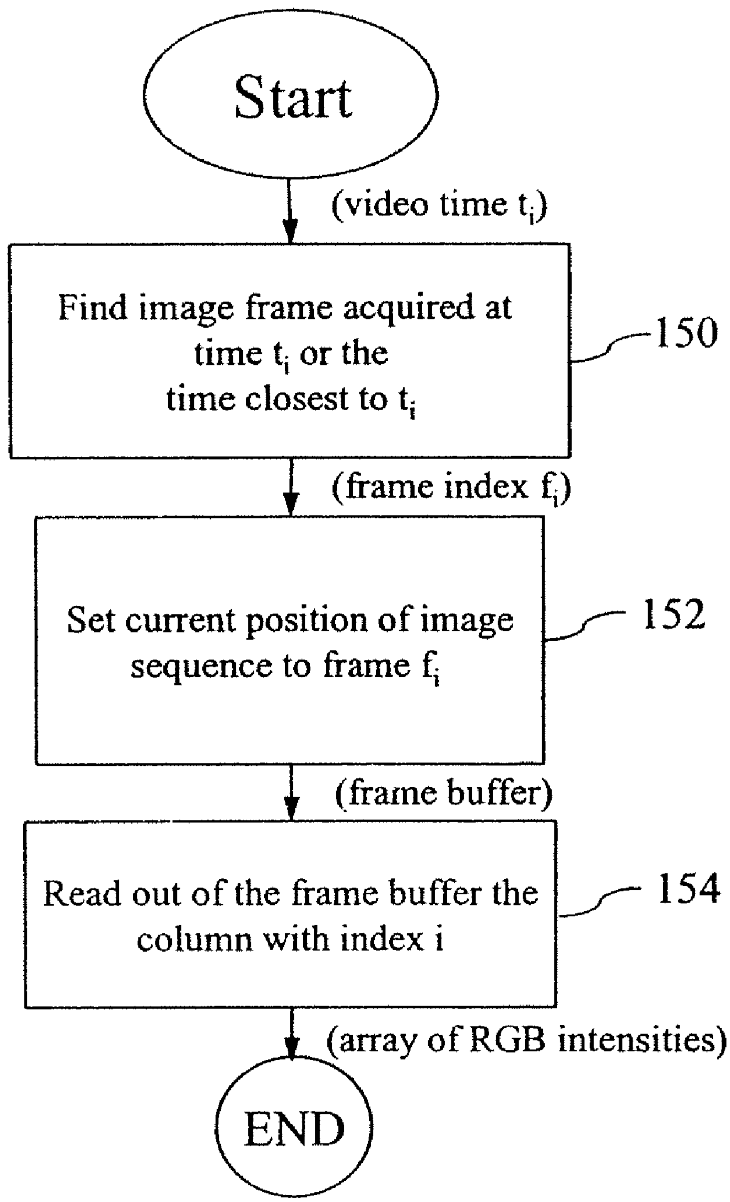

Start
(video time t_i)
Find image frame acquired at time t_i or the time closest to t_i
150
(frame index f_i)
Set current position of image sequence to frame f_i
152
(frame buffer)
Read out of the frame buffer the column with index i
154
(array of RGB intensities)
END

Fig. 11

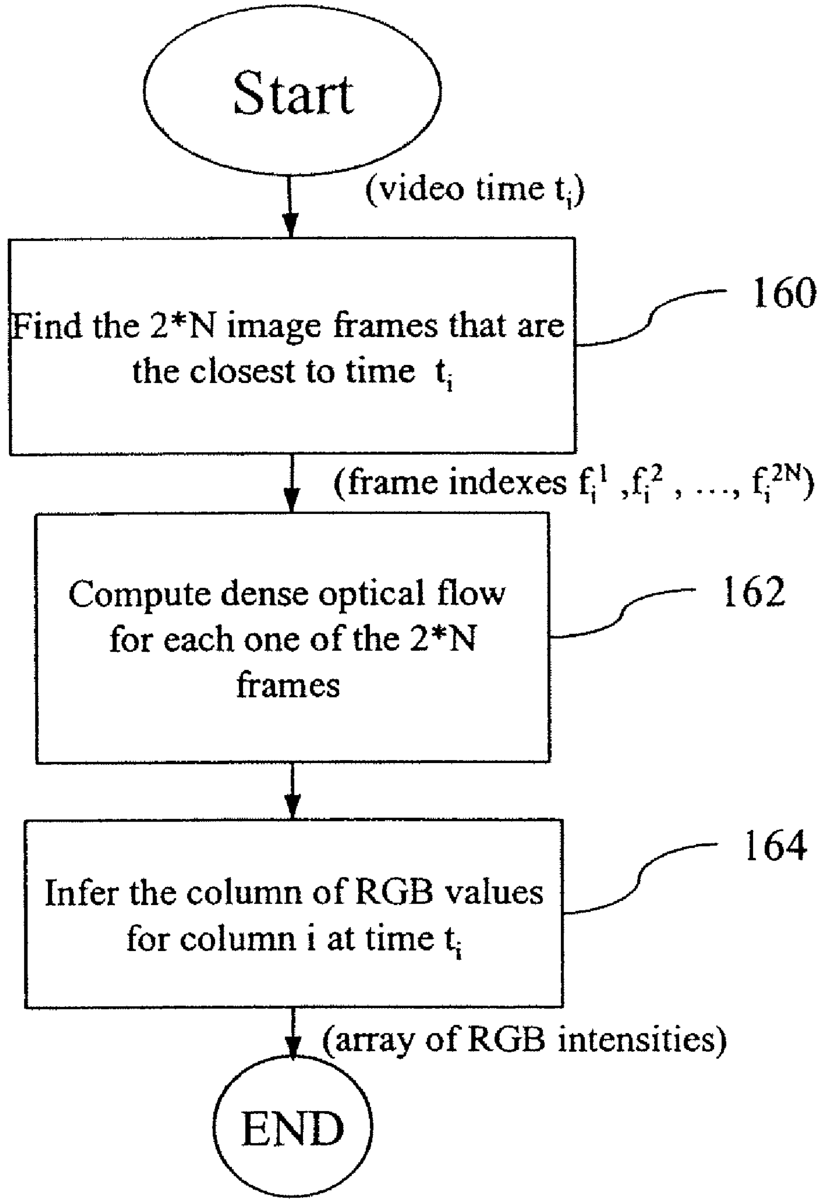

Start
(video time t_i)
Find the 2*N image frames that are the closest to time t_i
160
(frame indexes $f_i^1, f_i^2, \ldots, f_i^{2N}$)
Compute dense optical flow for each one of the 2*N frames
162
Infer the column of RGB values for column i at time t_i
164
(array of RGB intensities)
END

Fig. 12

172	174	176	178	180	182	184	186	188
Segment ID	Street Name	Side of Street with Respect to Hub	End Point Coordinates	Segments Adjacent to From Coordinates	Segments Adjacent to To Coordinates	Distance from Hub	Length of Trajectory Segment	Offset
1	Colorado Boulevard	West	(10, 10), (50, 10)	2(N) 4(S) 3(W) 1(E)	5(N) 7(S) 1(W) 6(E)	(120m, 122m)	(28m, 30m)	(2,0)
6	Colorado Boulevard	West	(50, 10) (65,10)	5(N) 7(S) 1(W) 6(E)	8(W) 10(S) 6(W) 9(E)	(130m, 134m)	(20m, 22m)	(0,0)

170

Fig. 13

202 204 206

Segment ID	Side Viewed	Distance of Center Position
1	Even	8m
2	Odd	8m
1	Even	16m

200

Fig. 14

210

Block Label (212)	Segment IDs (214)
(50, 50)	1, 4, 7, 9
(50, 100)	2, 5, 8, 10, 11

Fig. 15

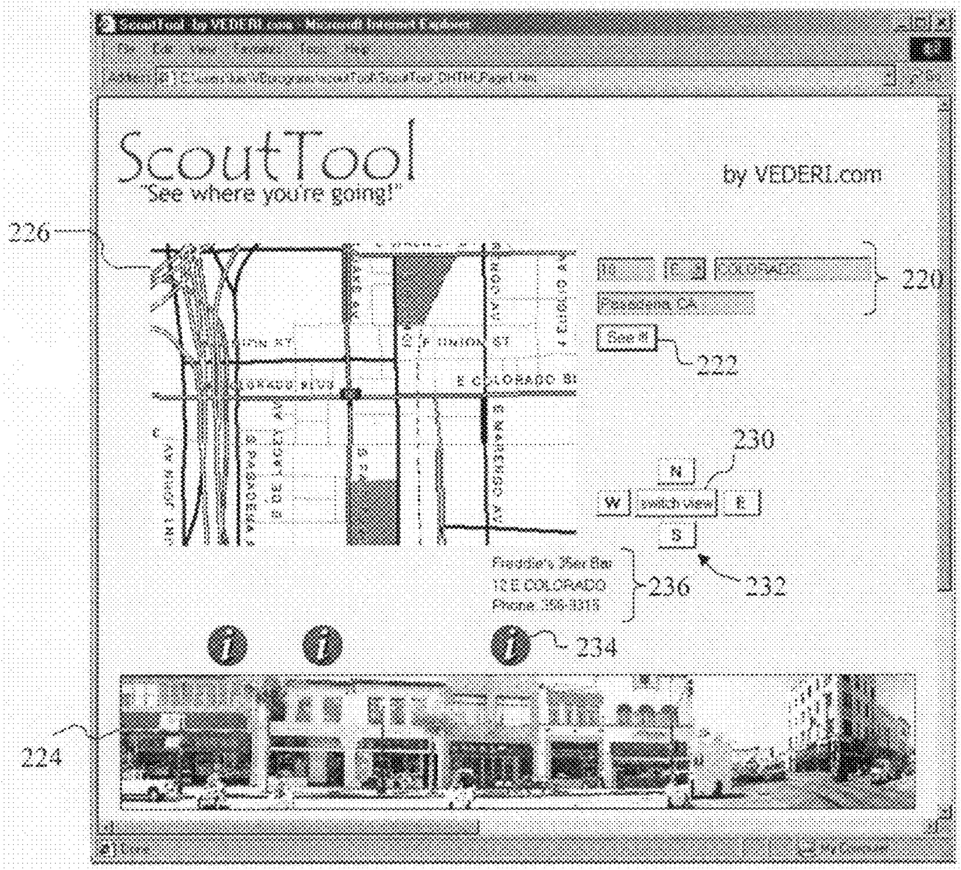

ScoutTool
"See where you're going!"
by VEDERI.com
226
220
See it
222
230
N
W
switch view
E
S
Freddie's 35er Bar
12 E COLORADO
236
232
234
224

Fig.16

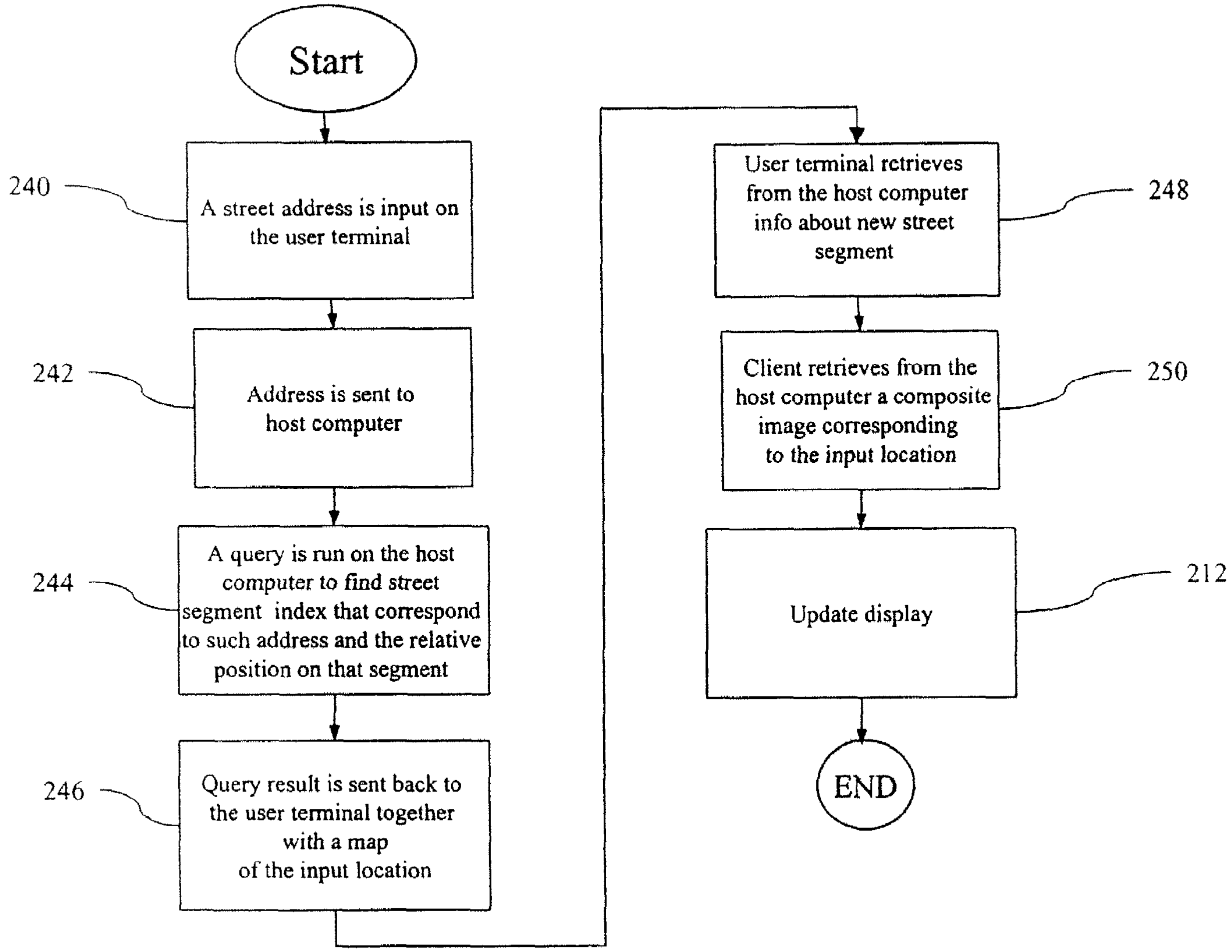

Start
240
A street address is input on the user terminal
242
Address is sent to host computer
244
A query is run on the host computer to find street segment index that correspond to such address and the relative position on that segment
246
Query result is sent back to the user terminal together with a map of the input location
248
User terminal retrieves from the host computer info about new street segment
250
Client retrieves from the host computer a composite image corresponding to the input location
212
Update display
END

Fig.17

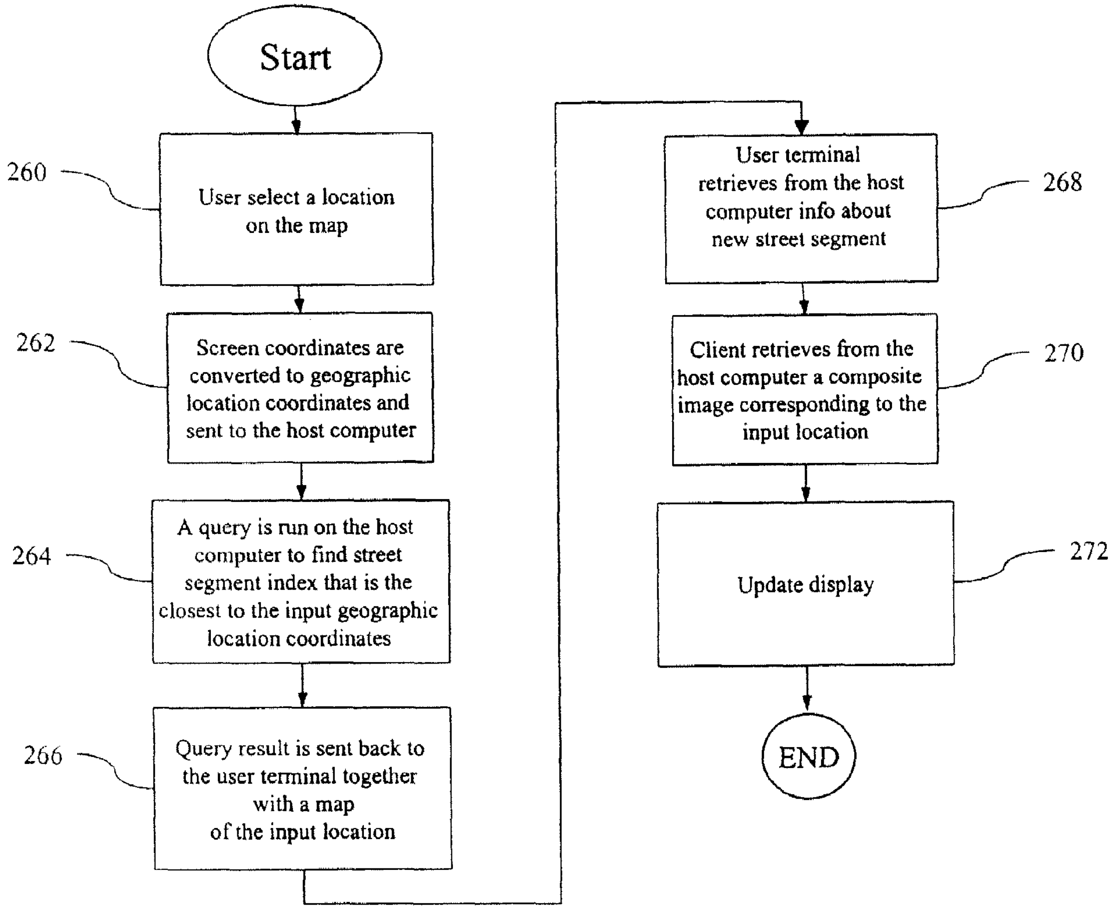

Start
260
User select a location on the map
262
Screen coordinates are converted to geographic location coordinates and sent to the host computer
264
A query is run on the host computer to find street segment index that is the closest to the input geographic location coordinates
266
Query result is sent back to the user terminal together with a map of the input location
268
User terminal retrieves from the host computer info about new street segment
270
Client retrieves from the host computer a composite image corresponding to the input location
272
Update display
END

Fig.18

SYSTEM AND METHOD FOR CREATING, STORING AND UTILIZING IMAGES OF A GEOGRAPHIC LOCATION

CROSS-REFERENCE TO RELATED APPLICATION(S)

This application is a continuation of U.S. Pat. No. 11/130, 004, filed May 16, 2005, U.S. Pat. No. 7,239,760, issued Jul. 3, 2007, which is a divisional of patent application Ser. No. 09/758,717, filed Jan. 11, 2001, now U.S. Pat. No. 6,895,126, issued May 17, 2005, which claims the benefit of U.S. provisional patent application No. 60/238,490, filed Oct. 6, 2000, the disclosures of which are hereby incorporated by reference in their entirety for all purposes.

FIELD OF THE INVENTION

This invention relates to visual databases, specifically to the creation and utilization of visual databases of geographic locations.

BACKGROUND OF THE INVENTION

There exist methods in the prior art for creating visual databases of geographic locations. However, such databases are of limited use due to the method of acquiring the imagery as well as the kind of imagery acquired. One particular method involves the taking of individual photographs of the location and electronically pasting the photographs on a polygonal mesh that provide the framework for a three-dimensional (3D) rendering of the location. This method, however, is time consuming and inefficient for creating large, comprehensive databases covering a substantial geographic area such as an entire city, state, or country.

Another method uses video technology to acquire the images. The use of video technology, especially digital video technology, allows the acquisition of the image data at a higher rate, reducing the cost involved in creating the image databases. For example, the prior art teaches the use of a vehicle equipped with a video camera and a Global Positioning System (GPS) to collect image and position data by driving through the location. The video images are later correlated to the GPS data for indexing the imagery. Nevertheless, such a system is still limited in its usefulness due to the lack of additional information on the imagery being depicted.

The nature of the acquired imagery also limits the usefulness of such a system. A single image acquired by the video camera contains a narrow field of view of a locale (e.g. a picture of a single store-front) due to the limited viewing angle of the video camera. This narrow field of view provides little context for the object/scene being viewed. Thus, a user of such an image database may find it difficult to orient himself or herself in the image, get familiar with the locale, and navigate through the database itself.

One way to increase the field of view is to use a shorter focal length for the video camera, but this introduces distortions in the acquired image. Another method is to increase the distance between the camera and the buildings being filmed. However, this may not be possible due to the limit on the width of the road and constructions on the opposite side of the street.

The prior art further teaches the dense sampling of images of an object/scene to provide different views of the object/scene. The sampling is generally done in two dimensions either within a plane, or on the surface of an imaginary sphere surrounding the object/scene. Such a sampling, however, is

computationally intensive and hence cumbersome and inefficient in terms of time and cost.

Accordingly, there is a need for a system and method for creating a visual database of a comprehensive geographic area in a more time and cost efficient manner. Such a system should not require the reconstruction of 3D scene geometry nor the dense sampling of the locale in multiple dimensions. Furthermore, the images in the database should provide a wider field of view of a locale to provide context to the objects being depicted. The database should further correlate the images with additional information related to the geographic location and objects in the location to further enhance the viewing experience.

SUMMARY OF THE INVENTION

The present invention addresses and alleviates the above-mentioned deficiencies associated with the prior art. More particularly, the present invention is directed to a computer-implemented system and method for synthesizing images of a geographic location to generate composite images of the location. The geographic location may be a particular street in a geographic area with the composite images providing a view of the objects on each side of the street.

According to one aspect of the invention, an image recording device moves along a path recording images of objects along the path. A GPS receiver and/or inertial navigation system provides position information of the image recording device as the images are being acquired. The image and position information is provided to a computer to associate each image with the position information.

The computer synthesizes image data from the acquired images to create a composite image depicting a view of the objects from a particular location outside of the path. Preferably, the composite image provides a field of view of the location that is wider than the field of view provided by any single image acquired by the image recording device.

In another aspect of the invention, the path of the camera is partitioned into discrete segments. Each segment is preferably associated with multiple composite images where each composite image depicts a portion of the segment. The composite images and association information are then stored in an image database.

In yet another aspect of the invention, the image database contains substantially all of the static objects in the geographic area allowing a user to visually navigate the area from a user terminal. The system and method according to this aspect of the invention identifies a current location in the geographic area, retrieves an image corresponding to the current location, monitors a change of the current location in the geographic area, and retrieves an image corresponding to the changed location. A map of the location may also be displayed to the user along with information about the objects depicted in the image.

DESCRIPTION OF THE DRAWINGS

FIG. **1** is a schematic block diagram of a data acquisition and processing system for acquiring image and position data used to create composite images of a geographic location;

FIG. **2** is an illustration of a composite image created by the data acquisition and processing system of FIG. **1**;

FIG. **3** is a high-level flow diagram of the steps exercised by the data acquisition and processing system of FIG. **1** in creating and storing the composite images;

FIG. **4** is a flow diagram for synchronizing image sequences with position sequences of a recording camera according to one embodiment of the invention;

FIG. **5** is a flow diagram of an alternative embodiment for synchronizing image sequences with position sequences of a recording camera;

FIG. **6** is a block diagram of the data acquisition and processing system of FIG. **1** allowing a real-time synchronization of image and position data;

FIG. **7** is another embodiment for synchronizing image sequences with position sequences of a recording camera;

FIG. **8** is a flow diagram for segmenting and labeling a camera trajectory;

FIG. **9** is an illustration of a trajectory in a single camera scenario;

FIG. **10** is a flow diagram for creating a composite image of a segment of a camera's path;

FIG. **11** is a flow diagram for identifying and retrieving an optical column from an acquired image according to one embodiment of the invention;

FIG. **12** is a flow diagram for identifying and retrieving an optical column from an acquired image according to an alternative embodiment of the invention;

FIG. **13** is an illustration of an exemplary street segments table including street segments in a camera's trajectory;

FIG. **14** is an illustration of an exemplary image coordinates table for associating composite images with the street segments in the street segments table of FIG. **13**;

FIG. **15** is an illustration of an exemplary segment block table for allowing an efficient determination of a segment that is closest to a particular geographic coordinate;

FIG. **16** is a photograph of an exemplary graphical user interface for allowing the user to place requests and receive information about particular geographic locations;

FIG. **17** is a flow diagram of a process for obtaining image and location information of an express street address; and

FIG. **18** is a flow diagram of the process for obtaining image and location information of a location selected from a map.

DETAILED DESCRIPTION OF THE INVENTION

FIG. **1** is a schematic block diagram of a data acquisition and processing system for acquiring and processing image and position data used to create composite images of a geographic location. The composite images are created by synthesizing individual image frames acquired by a video camera moving through the location and filming the objects in its view. The composite images may depict on urban scene including the streets and structures of an entire city, state, or country. The composite images may also depict other locales such as a zoo, national park, or the inside of a museum, allowing a user to visually navigate the locale.

The data acquisition and processing system includes one or more image recording devices preferably taking the form of digital video cameras **10** moving along a trajectory/path and recording images on the trajectory on digital videotapes **12**. Other types of acquisition devices may also be used in combination to, or in lieu of, the digital cameras **10**, such as analog cameras. Furthermore, the video images may be recorded on optical, magnetic, or silicon video tapes, or on any other known types of storage devices that allow random access of particular image frames and particular video pixels within the image frames.

The data acquisition and processing system further includes a GPS receiver **16** for receiving position information from a set of GPS satellites **18** as the cameras **10** move along the trajectory. An inertial navigation system **20** including one or more accelerometers and/or gyroscopes also provides position information to the data acquisition and processing system. When the inertial navigation system **20** is used in conjunction with the GPS receiver **16**, a more accurate calculation of the position information may be produced.

In an alternative embodiment, position information is acquired using devices other than the inertial navigation system **20** and/or the GPS receiver **16**, such as via computer-vision-based algorithms that compute positions using video information from the video cameras **10**.

The video cameras **10** provide to a multiplexer **22** a frame number and time information for each image acquired via a communication link **24** preferably taking the form of a LANC™ port. The GPS receiver **16** and inertial navigation system **20** also provide position information to the multiplexer **22** via communication links **26***a*, **26***b*, preferably taking the form of RS-232 ports. The multiplexer **22** in turn transmits the received frame number, time information, and position data to a data acquisition computer **34** via a communication link **30**, which also preferably takes the form of an RS-232 port. The computer **34** stores in a trajectory database **36** the position data from the GPS receiver **16** and/or inertial navigation system **20** along with the frame number and time information from the video cameras **10**. This information is then used by a post-processing system **38** to create the composite images.

The post-processing system **38** preferably includes a post-processing computer **28** in communication with a video player **39**. The computer **28** preferably includes a video acquisition card for acquiring and storing the image sequences as the video player **39** plays the videotapes **12** of the acquired images. The computer **28** includes a processor (not shown) programmed with instructions to take the image and position data and create one or more composite images for storing into an image database **32**. The image database **32** is preferably a relational database that resides in a mass storage device taking the form of a hard disk drive or drive array. The mass storage device may be part of the computer **28** or a separate database server in communication with the computer.

In an alternative embodiment, the images are transferred directly to the data acquisition computer **34** as the images are being recorded. In this scenario, the computer **34** is preferably equipped with the video acquisition card and includes sufficient storage space for storing the acquired images. In this embodiment, the data acquisition computer **34** preferably contains program instructions to create the composite images from the acquired images.

In general terms, a composite image of a particular geographic location is created by using at least one video camera **10** recording a series of video images of the location while moving along a path. In the one camera scenario, the camera **10** is moved twice on the same path but in opposite directions to film the objects on both sides of the path. Movement to the camera **10** is provided by a base, platform, or motor vehicle moving at an average speed of preferably about 20 miles/hour to ensure a sufficient resolution in the resulting images. Video cameras with higher sampler rates may allow for faster acquisition speeds.

Preferably, the data acquisition and processing system uses four cameras **10** mounted on top of a moving motor vehicle. Two side cameras face each side of the path for filming objects viewed from the each side of the vehicle. A front and back cameras allow the filming of the objects viewed from the front and back of the vehicle. The front and back cameras may be equipped with fish-eye lens for providing a wide-angle

view of the path. A person skilled in the art should recognize, however, that additional cameras may be used to film the objects from different viewing directions. For example, a duodecahedron of cameras may be used to record the objects from all viewing directions. Furthermore, the side cameras need not face directly to the side of the street, but may face a slightly forward or backward direction to provide a look up or down of the path.

As the images acquired by the cameras **10** are recorded on the videotapes **12**, the frame number and time associated with the images are transferred to the data acquisition computer **34**. The images recorded on the videotapes **12** are later transferred to the post-processing computer **28** for further processing. Once the images are received, the computer **28** stores the image data in its memory in its original form or as a compressed file using one of various well-known compression schemes, such as MPEG.

As the camera **10** moves along the path and records the objects in its view, the GPS receiver **16** computes latitude and longitude coordinates using the information received from the set of GPS satellites **18** at selected time intervals (e.g. one sample every two seconds). The latitude and longitude coordinates indicate the position of the camera **10** during the recording of a particular image frame. The GPS satellite **18** also transmits to the GPS receiver **16** a Universal Time Coordinate (UTC) time of when the coordinates were acquired. The GPS receiver **16** is preferably located on the vehicle transporting the camera **10** or on the camera itself. The GPS data with the position sequences and UTC time information is then transferred to the computer **34** for storing in the trajectory database **36**.

In addition to the position information provided by the GPS receiver **16**, the inertial navigation system **20** also provides acceleration information to the computer **34** for independently deriving the position sequence of the camera **10**. Specifically, the one or more accelerators and gyroscopes in the inertial navigation system **20** monitor the linear and rotational acceleration rates of the camera **10** and transfer the acceleration data to the computer **34**. The computer **34** integrates the acceleration data to obtain the position of the camera **10** as a function of time. The computer **34** preferably combines the position derived from the acceleration information with the GPS position data to produce a more accurate evaluation of the position of the camera **10** at particular instances in time.

The post-processing computer **28** uses the image and position sequences to synthesize the acquired images and create composite images of the location that was filmed. The composite images preferably provide a wider field of view of the location than any single image frame acquired by the camera **10**. In essence, the composite images help provide a panoramic view of the location.

FIG. **2** is an illustration of a composite image **40** created from the image frames **42** acquired by the camera **10** while moving along an x-axis **58** direction. In creating the composite image **40**, the computer assumes a fictitious camera **44** located behind the actual camera **10** and identifies optical rays **46** originating from the fictitious camera. The location of the fictitious camera **44** depends on the desired field of view of the location being filmed. The further away the fictitious camera is placed from the objects along the x-axis **58**, the wider its field of view of the objects.

The computer also identifies optical rays **48** originating from the actual camera **10**. For each optical ray **46** from the fictitious camera **44**, the computer **28** selects an acquired image frame **42** that includes a corresponding optical ray **48** originating from the actual camera **10**. Image data from each selected image frame **42** is then extracted and combined to form the composite image. Preferably, the image data extracted from each image frame is an optical column that consists of a vertical set of pixels. The composite image is preferably created on a column-by-column basis by extracting the corresponding optical column from each image frame. Thus, to create a column Pi **50** in the composite image **40**, the computer locates an image frame **42***a* that was acquired when the camera **10** was located at Xi **52**. To locate this image frame **42***a*, the computer uses the GPS data and/or data from the inertial navigation system **20** to identify a time Ti **54** at which the camera **10** was in the location Xi **52**. Once the image frame **42***a* is identified, the computer **28** extracts the optical column **56** with an index (Pi/N)*M, where N is the total number of columns in the composite image **40** and M is the number of columns in the image frame **42***a*. The composite image **40** is stored in the image database **32**, preferably in JPEG format, and associated with an identifier identifying the particular geographic location depicted in the image. Furthermore, close-ups and fish-eye views of the objects are also extracted from the video sequences using well-known methods, and stored in the image database **32**. The unused data from the acquired images is then preferably deleted from the computer's memory.

FIG. **3** is a high-level flow diagram of the steps exercised by the data acquisition and processing system in creating and storing the composite images. In step **60**, the camera **10** acquires a series of images of a particular geographic location. At the same time, the GPS receiver **16** and/or inertial navigation system **20** acquires the position of the camera **10** while the images are being acquired. Because the time associated with the position information (position time) is likely to differ from the times of acquisition of the video images (video time), the computer **28**, in step **62**, synchronizes the image sequence with the position sequence. The synchronization is preferably a post-processing step that occurs after the image and position sequences have been acquired.

In step **64**, the computer **28** segments the trajectory taken by the recording camera **10** into multiple segments and labels each segment with identifying information about the segment. For example, if the camera traverses through various streets, the computer **28** segments the trajectory into multiple straight street segments and associates each street segment with a street name and number range. In step **66**, the computer **28** generates a series of composite images depicting a portion of each segment, and in step **68**, stores each composite image in the image database **32** along with the identifying information of the segment with which it is associated.

FIG. **4** is a more detailed flow diagram of step **62** for synchronizing the image sequences with the position sequences of the recording camera according to one embodiment of the invention. Although the process illustrated in FIG. **4** assumes that the position data is GPS data, a person skilled in the art should recognize that a similar process may be employed to synchronize the images to positions calculated using the inertial navigation system **20**.

The process starts, and in step **70**, a user of the system selects a landmark in the image sequence that appears in at least two distinct video frames. This indicates that the landmark was recorded once while the camera **10** was moving on one direction on the path, and again while the camera was moving in an opposite direction on the same path. The landmark may be, for example, a tree in a lane divider.

In step **72**, a time interval T is measured in the image sequence between the two passings of the landmark. In step **74**, the computer **28** uses the GPS data to compute a function for determining the time interval between successive passes of any point along the path. The function is then used to find,

for each point x on the path, a time of return Tr(x) which measures the lapse of time between the two passings of each point. In step **76**, a point is identified for which Tr(x)=T. The identified point provides the GPS position of the landmark and hence, a GPS time associated with the landmark. Given the GPS time, a difference between the GPS time and the video time associated with the landmark may be calculated for synchronizing any image frame acquired at a particular video time to the GPS position of the camera at a particular GPS time.

FIG. **5** is a flow diagram of an alternative embodiment for synchronizing the image sequences with GPS position information. As in FIG. **4**, the process illustrated in FIG. **5** also identifies, in step **80**, a landmark in the image sequence that appears in at least two distinct image frames. In step **82**, a time phase is initialized to an arbitrary value using the camera time stamp. In step **84**, the computer **28** measures the distance traveled between the two points on the path that correspond to the time instants in the image sequence where the landmark is seen from the two sides of the path. In step **86**, an inquiry is made as to whether the distance has been minimized. If the answer is NO, the time phase is modified in step **88**, and the process returns to step **84** where the distance is measured again.

In another embodiment, the synchronization does not occur as a post-production process, but occurs in real-time as the image and position sequences are acquired. FIG. **6** is a block diagram of a portion of the data acquisition and processing system of FIG. **1** allowing a real-time synchronization of image and position data. A UTC clock generator **90** provides to the data acquisition computer **34** the UTC time associated with each GPS position of the recording camera **10** as the camera moves along the path. The video time produced by a camera clock **92** is also provided to the data acquisition computer **34** via the communications port **24**. A UTC card **94** on the computer **34** correlates the video time to the UTC time. Thus, the video image acquired at the video time may be correlated to the GPS position of the camera during the recording of the image.

FIG. **7** is yet another embodiment for synchronizing the image sequences with the GPS position of the recording camera **10**. In step **100**, the post-processing computer **28** computes the temporal variation in the image values (i.e. optical flow) of the bottom pixel rows in the image sequence. Thus, the average velocity of each of the pixels in the row may be obtained. In step **102**, the tangential velocity of the camera **10** is obtained from the GPS reading. The average velocity for the computed pixels is directly proportional to the vehicle tangential velocity. Thus, in step **104**, the time phase between the position and video sequences may be determined as a time delay maximizing the alignment of local maxima and local minima between the average pixel velocity and the vehicle tangential velocity. This time phase is then read out in step **106**.

FIG. **8** is a more detailed flow diagram of step **64** of FIG. **3** for segmenting the trajectory followed by one or more recording cameras **10** and labeling the segments with an identifier. In the one camera scenario, the camera is moved along the path making a right turn at each intersection until a block **112** has been filmed, as is illustrated in FIG. **9**. The camera then moves to a second block **114** to film the objects on that block. Thus, a particular path **110** adjoining the two blocks **112**, **114** is traversed twice on opposite directions allowing the filming of the objects on each side of the path.

In step **120**, the post-processing computer **28** segments the camera's trajectory into straight segments by detecting the points of maximum curvature (i.e. where the turns occur). In this regard, the latitude and longitude coordinates provided by the GPS receiver **16** are converted into two-dimensional Mercator coordinates according to well-known methods. A spline interpolation is then obtained from the two-dimensional Mercator coordinates and the resulting spline function is parameterized in arc-length. The computer **28** obtains a new sampling of the coordinates from the spline function by uniformly sampling the coordinates in an arc-length increment of about one meter while detecting the points in the new sequence where a turn was made. The place where a turn occurs is assumed to be the place of an intersection of two segments.

Preferably, the computer **28** performs a singular value decomposition computation according to well-known methods to detect the turns. In this regard, the computer selects an observation window containing N sample points that is moved along the spline for calculating an index indicative of the overall direction (i.e. alignment) of the points in the window. The higher the index, the less aligned the points, and the more likely that the camera was making a turn at those points. The points are least aligned at the center of a turn, and thus, the computer selects as a turn coordinate a point in the observation window where the index is at a local maximum. The computer **28** gathers all the points whose indexes correspond to local maxima and stores them into an array of turn coordinates.

In step **122**, the computer **28** determines the center of an intersection by grouping the turn coordinates into clusters where turns that belong to the same cluster are turns made on the same intersection. An average of the turn coordinates belonging to the same cluster is then calculated and assigned as the intersection coordinate.

The endpoints of each straight segment are identified based on the calculated intersection coordinates. In this regard, an intersection coordinate at the start of the segment is identified and assigned to the segment as a segment start point (the "From" intersection coordinate). An intersection coordinate at the end of the segment is also identified and assigned to the segment as a segment end point (the "To" intersection coordinate).

In the scenario where at least two side cameras are utilized, each camera films the objects on each side of the path during the first pass on the path. Thus, unlike the single camera scenario where a turn is made at each intersection to move the camera along the same path twice but in opposite directions, a turn is not made at each intersection in the two camera scenario. Therefore, instead of identifying the points of maximum curvature for determining the intersection coordinates, the intersection coordinates are simply detected by tracking the GPS data and identifying where the segments orthogonally intersect.

The computer **28** associates the calculated segments with information obtained from a geographic information database **128** and stores it into a segments table as is described in further detail below. In the scenario where composite images of a city are created, the geographic information database **128** includes a map of the city where the endpoints of each street segment on the map are identified by latitude and longitude information. The database **128** further includes a street name and number range for each street segment on the map. Such databases are commercially available from third parties such as Navigation Technologies and Etak, Inc.

In correlating the segments of the camera's trajectory with the segments in the geographic information database **128**, the computer, in step **124**, determines the correspondences between the "From" and "To" coordinates calculated for the trajectory segment with intersection coordinates of the seg-

ments in the database. The computer **28** selects the segment in the geographic information database **128** which endpoints are closest to the computed "From" and "To" coordinates, as the corresponding segment.

In step **126**, the computer labels each trajectory segment with information that is associated with the corresponding segment in the database **128**. Thus, if each segment in the database **128** includes a street name and number, this information is also associated with the trajectory segment.

FIG. **10** is a more detailed flow diagram of step **66** of FIG. **3** for creating a composite image of a segment of the camera's path according to one embodiment of the invention. In step **130**, the computer **28** computes the arc length coordinate Xc of the center of the segment which is then set as the center of the composite image. In step **132**, the computer identifies the optical rays **46** (FIG. **2**) originating from the fictitious camera **44** by computing an array of equidistant positions X**1**, X**2**, . . . , Xn along the camera's trajectory, centered around Xc. The number of computed positions preferably depend on the number of optical columns that are to be created in the composite image.

In step **134**, the computer **28** uses the position information obtained from the GPS receiver **16** and/or inertial navigation system **20** to map each position Xi on the trajectory to a position time Ti. Thus, if GPS data is used to determine the camera's position, each position Xi of the camera **10** is mapped to a UTC time.

In step **136**, the computer **28** uses the time phase information computed in the synchronization step **62** of FIG. **3** to convert the position times to video times. For each identified video time, the computer **28**, in step **138**, identifies an associated image frame and extracts a column of RGB pixel values from the frame corresponding to the optical rays **46** originating from the fictitious camera **44**. In step **140**, the column of RGB pixel values are stacked side by side to generate a single image bitmap forming the composite image.

FIG. **11** is a more detailed flow diagram of step **138** for identifying and retrieving a column of RGB pixel values for a particular video time Ti according to one embodiment of the invention. In step **150**, the computer **28** identifies an image frame with frame index Fi acquired at time Ti. Because the image frames are acquired at a particular frame rate (e.g. one frame every 1/30 seconds), there may be a particular time Ti for which an image frame was not acquired. In this scenario, the frame closest to time Ti is identified according to one embodiment of the invention.

In step **152**, the current position of the image sequence is set to the image frame with index Fi, and the frame is placed into a frame buffer. In step **154**, a column in the image frame with an index i is read out from the frame buffer.

FIG. **12** is a flow diagram of an alternative embodiment for identifying and retrieving a column of RGB pixel values for a particular video time Ti. If an image frame was not acquired at exactly time Ti, the computer, in step **160**, identifies 2*N image frames that are closest to time Ti, where N>1. Thus, at least two image frames closest to time Ti are identified. In step **162**, the computer computes an optical flow field for each of the 2*N image frames and in step **164**, infers the column of RGB values for a column i at time Ti. In the situation where only two image frames are used to compute the optical flow, the computer identifies for each pixel in the first image frame a position X**1** and a position time T**1**. A corresponding pixel in the second frame is also identified along with a position X**2** and a position time T**2**. The position X' of each pixel at time Ti is then computed where $X'=X1+((Ti-T1)/(T2-T1))*(X2-X1)$. Given the position of each pixel at time Ti, a new frame that corresponds to time Ti may be inferred. The computer **28** may then extract the column of RGB values from the new frame for a column i.

Preferably, the computer **28** creates multiple composite images at uniform increments (e.g. every 8 meters) along a segment. In the scenario where the composite images are created for street segments, the composite images depict the view of the objects on each side of the street. The composite images are then stored in the image database **28** along with various tables that help organize and associate the composite images with street segment information.

According to one embodiment of the invention, the image database **32** includes composite images of a geographic area which together provide a visual representation of at least the static objects in the entire area. Thus, if the geographic area is a particular city, the composite images depict the city on a street-by-street basis, providing a visual image of the buildings, stores, apartments, parks, and other objects on the streets. The system further includes an object information database with information about the objects being depicted in the composite images. If the geographic area being depicted is a city, the object information database contains information about the structures and businesses on each city street. In this scenario, each record in the object information database is preferably indexed by a city address.

FIG. **13** is an illustration of an exemplary street segments table **170** including the street segments in the camera's trajectory. The table **170** suitably includes multiple entries where each entry is a record specific to a particular street segment. A particular street segment record includes an index identifying the street segment (segment ID) **172** as well as the corresponding street name **174** obtained from the geographic information database **128** (FIG. **12**). A particular street segment record also includes the direction of the street (North, South, East, or West) **176** with respect to a main city street referred to as a city hub. The direction information generally appears in an address in front of the street name. A city, state, and/or country fields may also be added to the table **170** depending on the extent of the geographic area covered in the image database **32**.

A street segment record includes the endpoint coordinates **178** of the corresponding street segment in the geographic information database **128**. An array of segment IDs corresponding to street segments adjacent to the segment start point are identified and stored in field **180** along with the direction in which they lie with respect to the start point (e.g. North, South, East, or West). Similarly, an array of segment IDs corresponding to street segments adjacent to the segment end point are also identified and stored in field **182**. These segments are also ordered along the direction in which they lie.

In addition to the above, a street segment record includes a distance of the start of the trajectory segment from the city hub **184**. The city hub generally marks the origin of the streets from which street numbers and street directions (North, South, East, or West) are determined. Street numbers are generally increased by two at uniform distances (e.g. every 12.5 feet) starting from the hub. Thus the distance from the hub allows a computation of the street numbers on the street segment. In a one camera situation where each segment is traversed twice, the distance from the hub is computed for each camera trajectory. In a multiple camera scenario, however, only one distance is computed since the camera traverses the segment only once.

Also included in a street segment record is a length of the trajectory segment. Such a length is computed for each tra-

jectory in a one camera **10** scenario because the movement of the camera **10** is not identical during the two traversals of the segment.

Each street segment record **170** further includes an offset value **188** for each side of the street. The offset is used to correct the street numberings computed based on the distance information. Such a computation may not be accurate if, for instance, there is an unusually wide structure on the segment that is erroneously assigned multiple street numbers because it overlaps into the area of the next number assignment. In this case, the offset is used to decrease the street numbers on the segment by the offset value.

FIG. **14** is an illustration of an exemplary image coordinates table **200** for associating the composite images with the street segments in the street segments table **170**. The image coordinates table **200** includes a plurality of composite image records where each record includes a segment ID **202** of the street segment being depicted in the composite image. In addition, each composite image record includes information of the side of the street segment **204** being depicted. For example, the side may be described as even or odd based on the street numbers on the side of the street being depicted. Each composite image entry also includes a distance from the segment origin to the center Xc of the composite image **206** indicating the position along the street segment for which the image was computed. The distance information is used to retrieve an appropriate composite image for each position on the street segment.

FIG. **15** is an illustration of an exemplary segment block table **210** for allowing an efficient determination of a segment ID that is closest to a particular geographic coordinate. In this regard, the geographic area depicted in the image database **32** is preferably partitioned into a grid of square blocks where each block includes a certain number of street segments. The blocks are assigned block labels preferably corresponding to the center longitude and latitude coordinates of the block. The block labels are stored in a block label field **212**. Associated with each block label are segment IDs **214** corresponding to the street segments in the block. Given the coordinates of a particular geographic location, the block closest to the given coordinates may be identified to limit the search of street segments to only street segments within the block.

In a particular use of the system, a user places inquiries about a location in a geographic area depicted in the image database **32**. For example, the user may enter an address of the location, enter the geographic coordinates of the location, select the location on a map of the geographic area, or specify a displacement from a current location. Preferably, the user has access to a remote terminal that communicates with a host computer to service the user requests. The host computer includes a processor programmed with instructions to access the image database **32** in response to a user request and retrieve composite images about the particular location. The processor is also programmed with instructions to access the geographic and object information databases to retrieve maps and information on the businesses in the geographic area. The retrieved data is then transmitted to the requesting remote user terminal for display thereon.

The remote user terminals may include personal computers, set-top boxes, portable communication devices such as personal digital assistants, and the like. The visual component of each remote user terminal preferably includes a VGA or SVGA liquid-crystal-display (LC) screen, an LED display screen, or any other suitable display apparatus. Pressure sensitive (touch screen) technology may be incorporated into the display screen so that the user may interact with the remote user terminal by merely touching certain portions of the screen. Alternatively, a keyboard, keypad, joystick, mouse, and/or remote control unit is provided to define the user terminal's input apparatus.

Each remote user terminal includes a network interface for communicating with the host computer via wired or wireless media. Preferably, the communication between the remote user terminals and the host computer occurs over a wide area network such as the Internet.

In an alternative embodiment of the invention, the image, geographic information, and object information databases reside locally at the user terminals in a CD, DVD, hard disk drive, or any other type of mass storage media. In this embodiment, the user terminals include a processor programmed with instructions to receive queries from the user about a particular geographic location and retrieve composite images and associated information in response to the user queries.

FIG. **16** is a photograph of an exemplary graphical user interface (GUI) for allowing the user to place requests and receive information about particular geographic locations. The GUI includes address input fields **220** allowing the user to enter the street number, street name, city and state of the particular location he or she desires to view. Actuation of a "See It" button **222** causes the user terminal to transmit the address to the host computer to search the image and geographic location databases **32**, **128** for the composite image and map corresponding to the address. Furthermore, the host computer searches the object information database to retrieve information about the objects depicted in the composite image.

The retrieved composite image and map are respectively displayed on the display screen of the requesting user terminal in a map area **226** and an image area **224**. The map is preferably centered around the requested address and includes a current location cursor **228** placed on a position corresponding to the address. The current location identifier **228** may, for instance, take the shape of an automobile.

The composite image displayed on the image area **224** provides a view of a side of the street (even or odd) based on the entered street number. The user may obtain information about the objects being visualized in the composite image by actuating one of the information icons **234** above the image of a particular object. In displaying the information icons **234**, a range of street addresses for the currently displayed image is computed. The listings in the object information database with street numbers that fall inside the computed range are then selected and associated with the information icons **234** displayed on top of the image of the object.

If the objects are business establishments, the information displayed upon actuating the information icons **234** may include the name, address, and phone number **236** of the establishment. This information is preferably displayed each time the user terminal's cursor or pointing device is passed above the icon. In addition, if the establishment is associated with a particular Web page, the information icon **234** functions as a hyperlink for retrieving and displaying the Web page, preferably on a separate browser window.

The user may obtain a close-up view of a particular object in the composite image by selecting the object in the image. A close-up view of the object is then obtained by computing the distance of the selected object from the origin of the street segment where they object lies. The location on the segment of the closest close-up image is computed and retrieved from the image database **32**. The close-up image is then provided in the image area **224** or in a separate browser window.

A "Switch View" button **230** allows the user to update the current composite image providing a view of one side of the street with a composite image of the other side of the street. In

a multiple camera scenario, each actuation of the "Switch View" button **230** provides a different view of the street. The current view is preferably identified by a direction identifier (not shown) on or close to the current location identifier **228**. For instance, one side of the current location identifier **228** may be marked with a dot or an "X" to identify the side of the street being viewed. Alternatively, an arrow may be placed near the current location identifier **228** to identify the current viewing direction.

The composite image is also updated as the user navigates through the streets using the navigation buttons **232**. From a current location, the user may choose to navigate north, south, west, and east by actuating the corresponding buttons. Preferably, only the navigation buttons corresponding to the possible direction of motions from the current position are enabled. As the user actuates one of the buttons, the current position is incremented by a predetermined amount, currently set to eight meters, to the next available composite image on the current or adjacent segment. The image area **224** is then updated with the new composite image.

FIG. **17** is a flow diagram of the process executed by the host computer for obtaining image and location information of an express street address entered in the address input fields **220**. A similar process is executed by the user terminal in the embodiment where the location and image information are stored locally at the user terminal.

The process starts, and in step **240**, the user requests information about a particular street address by entering the address in the address input fields **220**. In step **242**, the address is transmitted to the host computer preferably over a wide area network such as the Internet. In step **244**, a query is run on the host computer to locate the street segment index in the street segment table **170** (FIG. **13**) corresponding to the requested address. In this regard, the computer searches the street segment table **170** for street segments that match the desired street name **174** as well as a city, state, or country if applicable. For each street segment matching the street name, the computer computes the starting street number on that segment preferably based on the following formula:

$$\text{Start Number}=(\text{round}((\text{Distance from Hub}+\text{Offset})/K)*2)$$

The distance from the hub **184** and offset **188** values are obtained from the street segment table **170**. The value K is the distance assumed between any two street numbers on the segment.

The ending street number on the street segment is also calculated using a similar formula:

$$\text{End Number}=(\text{round}((\text{Distance from Hub}+\text{Offset}+\text{length})/K)*2)$$

The length is the length **186** value obtained from the street segment table **170**.

Once the start and end street numbers are calculated for a particular street segment, the computer determines whether the requested street number lies within the start and end street numbers. If it does, the computer returns the corresponding segment ID **172**. Furthermore, the computer determines the distance of the requested street number from the start of the street segment for determining the position of the street number on the street segment.

In step **246**, the host computer transmits the query result to the requesting user terminal along with a map of the input location retrieved from the geographic information database **128**. In step **248**, the requesting user terminal downloads from the host computer a record from the street segments table **170** corresponding to the identified street segment. Furthermore, the user terminal also retrieves the computed start and end street numbers of the street segment, a list of computed composite images for both sides of the street segment in the image coordinates table **200** (FIG. **14**), and information of the objects visible on the street segment in the object information database.

In step **250**, the user terminal downloads a composite image for the appropriate side of the street from the host computer that has a distance from the origin of the street segment to the center of the composite image **206** (FIG. **14**) that is closest to the distance of the desired street number from the origin. The display on the user terminal is then updated in step **252** with the new location and image information.

FIG. **18** is a flow diagram of the process executed by the host computer for obtaining image and location information of a particular location selected on the map displayed in the map area **226**. A similar process is executed by the user terminal in the embodiment where the location and image information are stored locally at the user terminal.

The process starts, and in step **260**, the user requests information about a particular street address by selecting a location on the map. In step **262**, the map coordinates are converted from screen coordinates to geographic location coordinates (x,y) and transmitted to the host computer preferably over the Internet. In step **244**, a query is run on the host computer to locate the street segment index in the street segment table **170** (FIG. **13**) corresponding to the geographic location coordinates. In this regard, the computer searches the segment block table **210** (FIG. **15**) for a block that includes the street segment corresponding to the input location. In order to locate such a block, the computer rounds the identified geographic location coordinates based preferably on the size of the block. The rounded (x,y) coordinates may thus be represented by ((round (x/B))*B, (round y/B)*B)), where B is the length of one of the block sides. The computer then compares the rounded number to the coordinates stored in the block label field **212** and selects the block with the label field **212** equal to the rounded coordinate. Once the appropriate block is identified, the computer proceeds to retrieve the segment IDs **214** associated with the block. The geographic coordinates of the desired location are then compared with the endpoint coordinates of each street segment in the block for selecting the closest street segment.

In step **266**, the segment ID of the closest street segment is returned to the user terminal. Additionally, a new map of the desired location may be transmitted if the previous map was not centered on the desired location.

In step **268**, the requesting user terminal downloads from the host computer a street segment record in the street segments table **170** corresponding to the identified street segment. The user terminal also retrieves the calculated start and end street numbers of the street segment, a list of computed composite images for both sides of the street the segment in the image coordinates table **200** (FIG. **14**), and information of the objects visible on the street segment in the object information database.

In step **270**, the user terminal downloads the composite image corresponding to the geographic coordinates of the input location. To achieve this, the geographic coordinates are converted to a distance along the identified street segment. The user terminal downloads a composite image that has a distance from the origin of the street segment to the center of the composite image **206** (FIG. **14**) that is closest to the distance of the input location from the origin. The display on the user terminal is then updated in step **272** with the new location and image information.

Although this invention has been described in certain specific embodiments, those skilled in the art will have no difficulty devising variations which in no way depart from the scope and spirit of the present invention. For example, the composite images may be made into streaming video by computing the composite images at small increments along the path (e.g. every 30 cm). Furthermore, the composite images may be computed at several resolutions by moving the fictitious camera **44** (FIG. **2**) closer or further away from the path to decrease or increase its field of view and provide the user with different zoom levels of the image.

Variation may also be made to correct any distortions in the perspective of the composite image along the vertical y-axis direction. The extraction of the optical columns from the acquired image frames may introduce such a distortion since the sampling technique used along the horizontal x-axis direction is not applied along the y-axis. Such a distortion may be corrected by estimating the depth of each pixel in the composite image using optical flow. The aspect ratio of each pixel may be adjusted based on the distance of the object visualized in the pixel. The distortion may also be corrected by acquiring images from an array of two or more video cameras **10** arranged along the vertical y-axis in addition to the cameras in the horizontal axis.

The described method of generating composite images also relies on an assumption that the camera's trajectory is along a straight line. If this is not the case and the vehicle carrying the camera makes a lane change, makes a turn, or passes over a bump, the choice of the optical column extracted from a particular image frame may be incorrect. The distortion due to such deviations from a straight trajectory may, however, be corrected to some degree using optical flow to detect such situations and compensate for their effect.

It is therefore to be understood that this invention may be practiced otherwise than is specifically described. Thus, the present embodiments of the invention should be considered in all respects as illustrative and not restrictive, the scope of the invention to be indicated by the appended claims and their equivalents rather than the foregoing description.

What is claimed is:

1. In a system including an image source and a user terminal having a screen and an input device, a method for enabling visual navigation of a geographic area from the user terminal, the method comprising:

receiving a first user input specifying a first location in the geographic area;

retrieving from the image source a first image associated with the first location, the image source providing a plurality of images depicting views of objects in the geographic area, the views being substantially elevations of the objects in the geographic area, wherein the images are associated with image frames acquired by an image recording device moving along a trajectory;

displaying an icon associated with an object in the geographic area;

receiving a user selection of the icon; and

identifying a second location based on the user selection.

2. The method of claim **1**, wherein the image source resides at a remote site and receives a request via a communications network for an image corresponding to the first or second location, and transmits the corresponding image to the user terminal via the communications network.

3. The method of claim **2**, wherein the retrieving of the image corresponding to the first or second location comprises:

identifying a street segment including the first or second location;

identifying a position on the street segment corresponding to the first or second location; and

identifying an image associated with said position.

4. The method of claim **3**, wherein the image simulates a view of objects on one side of the street segment and the method further comprises retrieving a second image depicting a view of objects on an opposite side of the street segment in response to a user request.

5. The method of claim **1**, wherein the image source resides at the user terminal and the method further comprises:

displaying the first image associated with the first location on the screen of the user terminal; and

updating the first image on the screen with a second image corresponding to the second location.

6. The method of claim **1** further comprising retrieving a map of a portion of the geographic area for displaying the map on the screen of the user terminal.

7. The method of claim **6**, wherein the first or second location is identified by a user selection of the location on the map using the input device.

8. The method of claim **6** further comprising:

displaying an icon on the map for identifying the first location.

9. The method of claim **8**, wherein the icon on the map is configured to indicate a viewing direction depicted in the first image.

10. The method of claim **1**, wherein the first location is identified by a specific address entered by a user using the input device.

11. The method of claim **1**, wherein the image source is an image database.

12. The method of claim **1**, wherein the first image is a composite image created based on a first one of the image frames acquired at a first point in the trajectory and a second one of the image frames acquired at a second point in the trajectory.

13. The method of claim **1**, wherein the first image is a composite image created by processing pixel data of a plurality of the image frames.

14. The method of claim **13**, wherein a first one of the plurality of image frames is acquired at a first point in the trajectory and a second one of the plurality of image frames is acquired at a second point in the trajectory.

15. The method of claim **1**, wherein the first image depicts a wider field of view than is depicted in any one of the image frames.

16. The method of claim **1** further comprising:

acquiring position information associated with the image recording device as the image recording device moves along the trajectory; and

synchronizing the image frames acquired by the image recording device with the position information.

17. The method of claim **16**, wherein the first image is associated with the first location based on the synchronized position information.

18. The method of claim **17**, wherein the first image is a composite image created by processing pixel data of a plurality of the synchronized image frames.

19. The method of claim **18**, wherein the composite image depicts a wider field of view than is depicted in any one of the plurality of the synchronized image frames.

20. The method of claim **1**, wherein the first location specified by the first user input is an arbitrary address entered via the first user input, the entered arbitrary address specifying information selected from a group consisting of street name, city, state, and zip code.

21. The method of claim **20** further comprising:

segmenting the trajectory on which the image recording devices moves, into a plurality of segments;

correlating the plurality of segments to a plurality of street segments in a geographic information database;

identifiing one of the plurality of street segments based on the arbitrary address;

retrieving the first image based on the identified one of the plurality of street segments; and

outputting the first image onto an image display device.

22. The method of claim **21**, wherein the correlating the plurality of segments includes correlating position data of the plurality of segments to position data of the plurality of street segments.

23. The method of claim **21**, wherein the first image is a composite image generated by processing pixel data of a plurality of the image frames taken on the segment of the trajectory correlated to the identified street segment.

24. The method of claim **23**, wherein the composite image provides a wider field of view than is depicted in any one of the image frames.

25. The method of claim **20**, wherein the first image is a composite image created based on a first one of the image frames acquired at a first point in the trajectory and a second one of the image frames acquired at a second point in the trajectory.

26. A system for enabling visual navigation of a geographic area from a user terminal, the system comprising:

means for accessing an image source providing a plurality of images depicting views of objects in the geographic area, the views being substantially elevations of the objects in the geographic area, wherein the images are associated with image frames acquired by an image recording device moving along a trajectory;

means for receiving a first user input specifying a first location in the geographic area;

means for retrieving from the image source a first image associated with the first location;

means for displaying an icon associated with an object in the geographic area;

means for receiving a user selection of the icon; and

means for identifying a second location based on the user selection.

27. The system of claim **26**, wherein the image source resides at a remote site and includes means for receiving a request for an image corresponding to the first or second location, and means for transmitting the corresponding image to the user terminal.

28. The system of claim **26**, wherein the image source resides at the user terminal and the system further comprises:

a display screen for displaying the first image of the first location; and

means for updating the first image on the screen with a second image corresponding to the second location.

29. The system of claim **26** further comprising means for retrieving a map of a portion of the geographic area for displaying the map on a screen of the user terminal.

30. The system of claim **29** further comprising:

means for receiving a selection of a particular location on the map associated with a particular geographic location;

means for retrieving a composite image associated with the particular location, the composite image being created by processing pixel data of a plurality of the image frames; and

means for outputting the composite image onto an image display device.

31. The system of claim **30** further comprising:

means for displaying an icon on the map for identifying the particular geographic location depicted by the composite image.

32. The system of claim **31**, wherein the icon on the map is configured to indicate a viewing direction depicted by the composite image.

33. The system of claim **30**, wherein the composite image depicts a wider field of view than is depicted in any one of the image frames.

34. The system of claim **30**, wherein the composite image is created based on a first one of the image frames acquired at a first point in the trajectory and a second one of the image frames acquired at a second point in the trajectory.

35. The system of claim **26** further comprising means for processing the image frames acquired from the image recording device moving through the geographic area.

* * * * *

UNITED STATES PATENT AND TRADEMARK OFFICE

CERTIFICATE OF CORRECTION

PATENT NO. : 7,577,316 B2
APPLICATION NO. : 11/761361
DATED : August 18, 2009
INVENTOR(S) : Enrico DiBernardo et al.

It is certified that error appears in the above-identified patent and that said Letters Patent is hereby corrected as shown below:

Column 16, Claim 4, line 4	Before “image” Insert -- first --
Column 17, Claim 21, line 2	Delete “moves” Insert -- move --
Column 17, Claim 21, line 5	Delete “identifiing” Insert -- identifying --

Signed and Sealed this
Fifteenth Day of November, 2011

David J. Kappos

David J. Kappos
Director of the United States Patent and Trademark Office

US007805025B2

(12) **United States Patent**
DiBernardo et al.

(10) **Patent No.: US 7,805,025 B2**
(45) **Date of Patent: *Sep. 28, 2010**

(54) **SYSTEM AND METHOD FOR CREATING, STORING AND UTILIZING IMAGES OF A GEOGRAPHIC LOCATION**

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(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 0 days.

This patent is subject to a terminal disclaimer.

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(60) Provisional application No. 60/238,490, filed on Oct. 6, 2000.

(51) **Int. Cl.**

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H04N 7/00	(2006.01)
G01C 21/00	(2006.01)

(52) **U.S. Cl.** **382/305**; 340/995.1; 348/113; 701/200

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See application file for complete search history.

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(74) *Attorney, Agent, or Firm*—Christie, Parker & Hale, LLP

(57) **ABSTRACT**

A system and method synthesizing images of a locale to generate a composite image that provide a panoramic view of the locale. A video camera moves along a street recording images of objects along the street. A GPS receiver and inertial navigation system provide the position of the camera as the images are being recorded. The images are indexed with the position data provided by the GPS receiver and inertial navigation system. The composite image is created on a column-by-column basis by determining which of the acquired images contains the desired pixel column, extracting the pixels associated with the column, and stacking the columns side by side. The composite images are stored in an image database and associated with a street name and number range of the street being depicted in the image. The image database covers a substantial amount of a geographic area allowing a user to visually navigate the area from a user terminal.

74 Claims, 18 Drawing Sheets

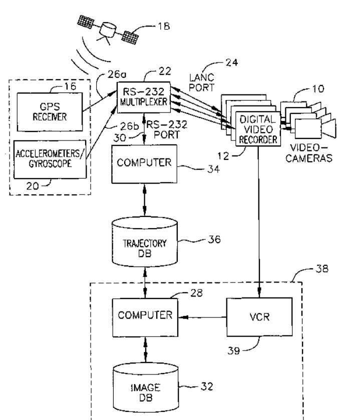

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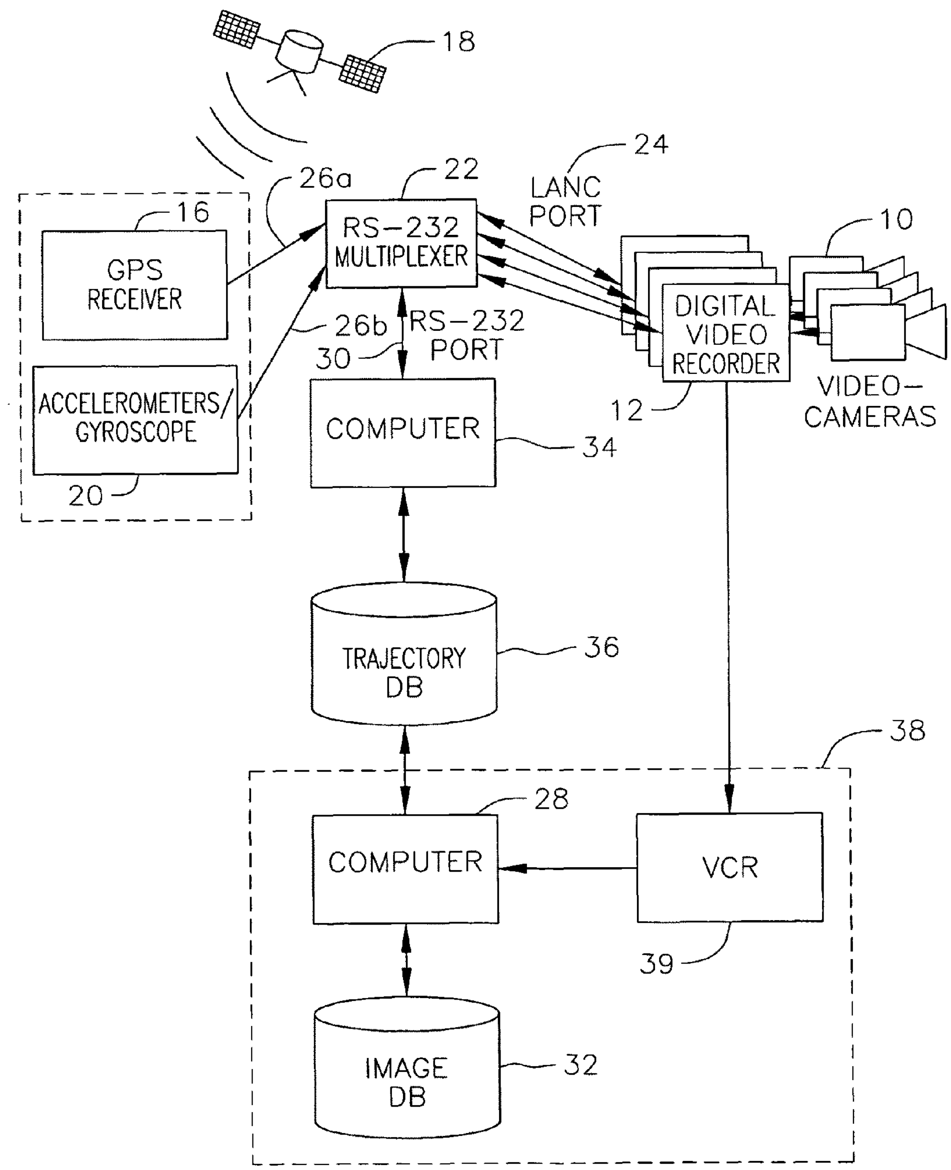
FIG.1



18
24
LANC PORT
22
26a
RS-232 MULTIPLEXER
16
GPS RECEIVER
10
DIGITAL VIDEO RECORDER
26b
RS-232 PORT
30
ACCELEROMETERS/ GYROSCOPE
VIDEO-CAMERAS
12
COMPUTER
34
20
TRAJECTORY DB
36
38
28
COMPUTER
VCR
39
IMAGE DB
32

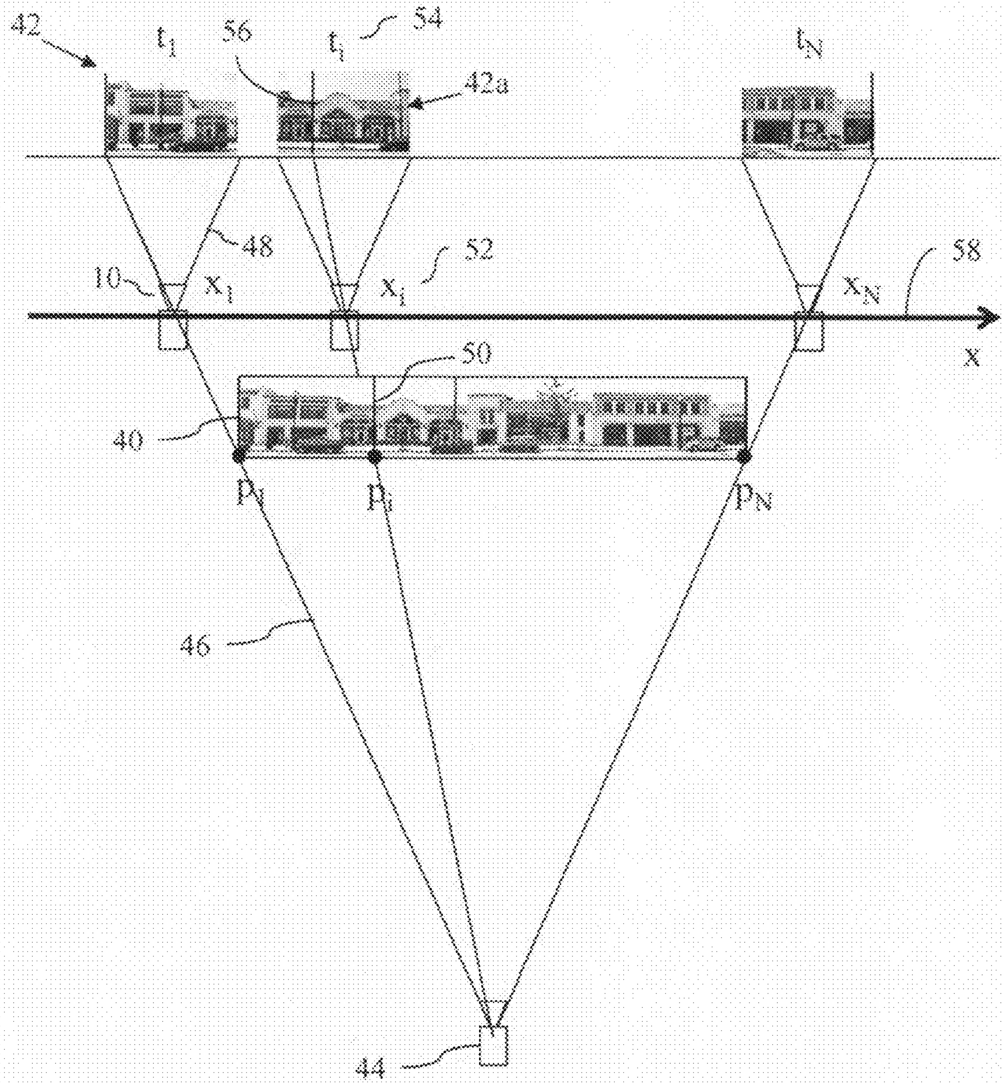


Fig.2

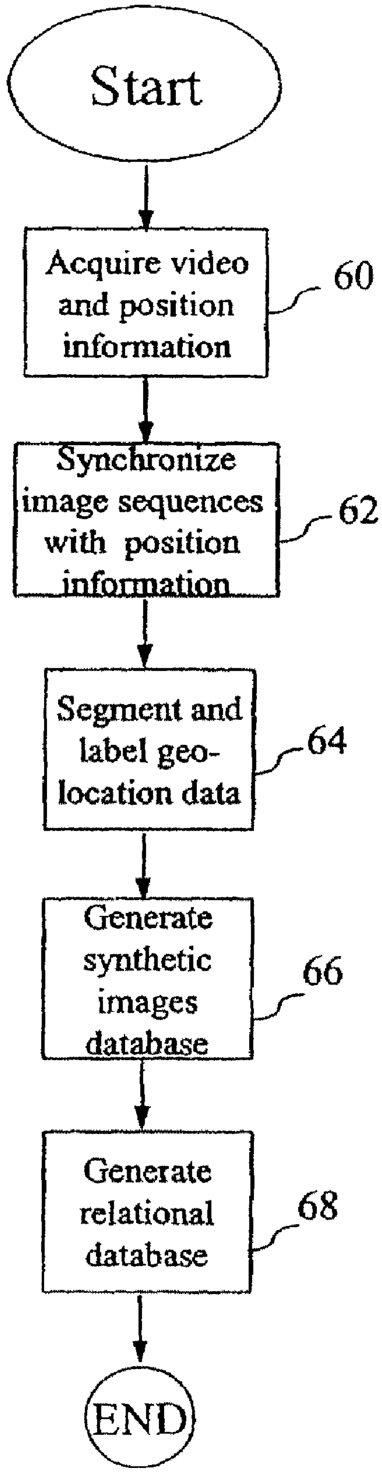

Start
Acquire video and position information
60
Synchronize image sequences with position information
62
Segment and label geo-location data
64
Generate synthetic images database
66
Generate relational database
68
END

Fig.3

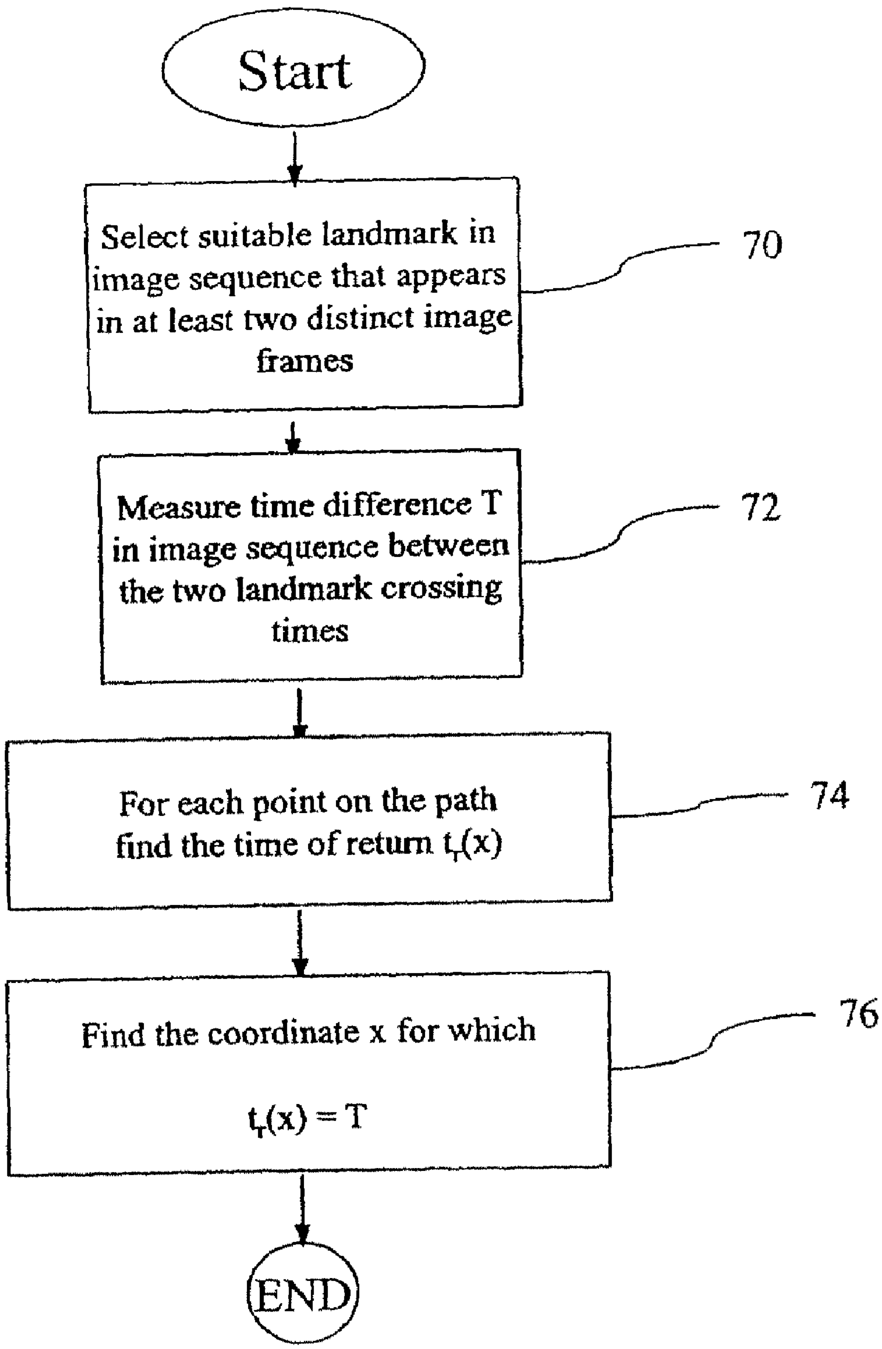

Start
Select suitable landmark in image sequence that appears in at least two distinct image frames
70
Measure time difference T in image sequence between the two landmark crossing times
72
For each point on the path find the time of return $t_r(x)$
74
Find the coordinate x for which
$t_r(x) = T$
76
END

Fig.4

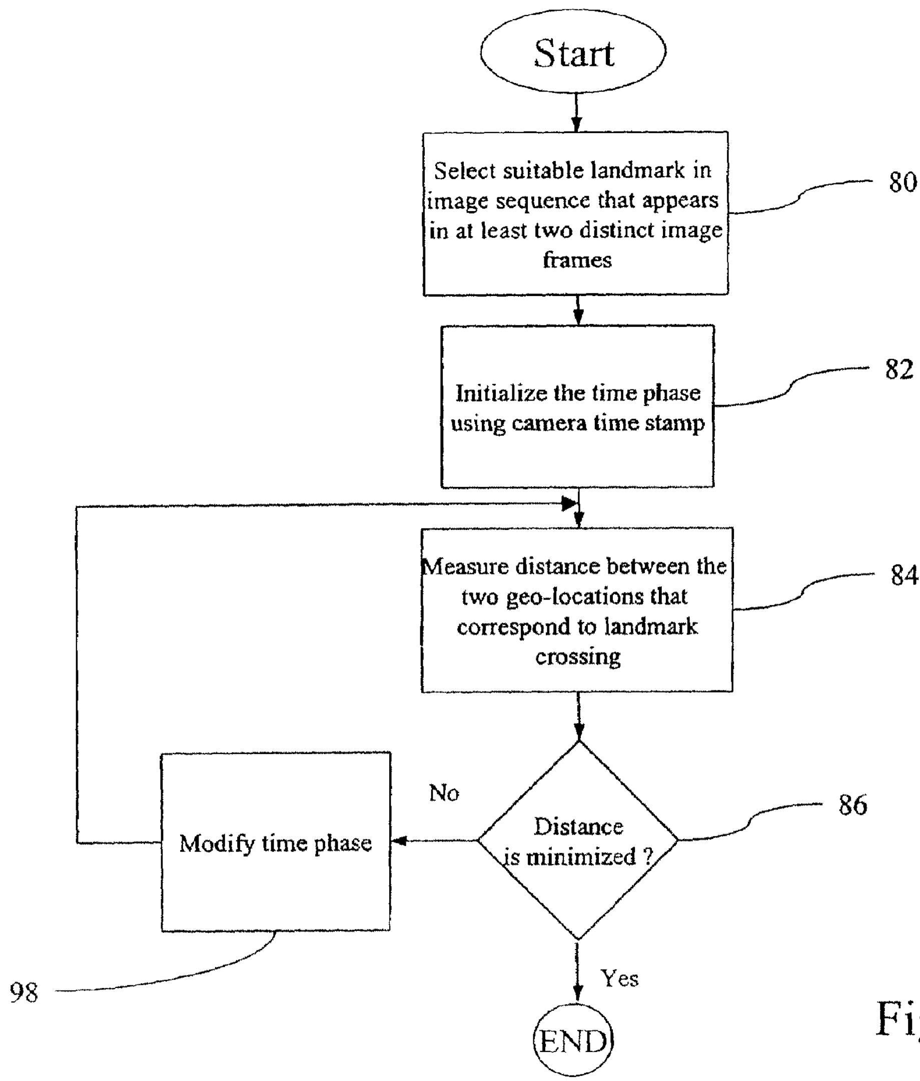

Start
Select suitable landmark in image sequence that appears in at least two distinct image frames
80
Initialize the time phase using camera time stamp
82
Measure distance between the two geo-locations that correspond to landmark crossing
84
Distance is minimized ?
86
No
Modify time phase
98
Yes
END

Fig.5

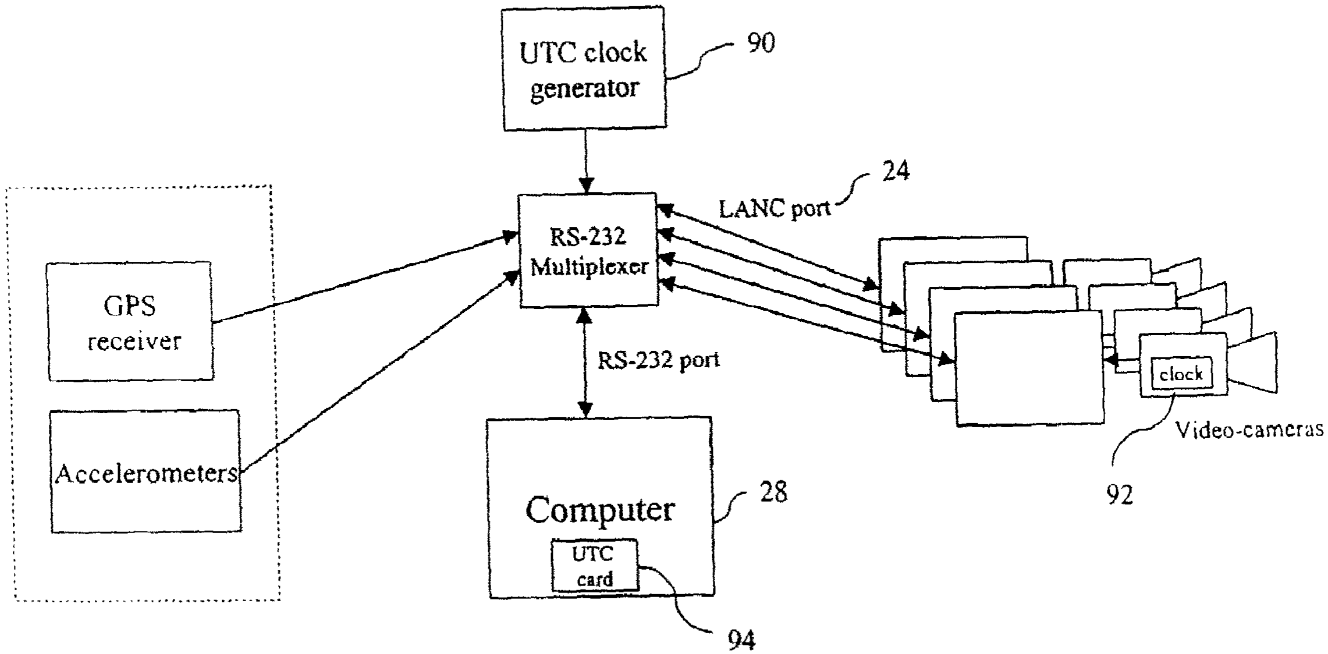

UTC clock generator
90
RS-232 Multiplexer
LANC port
24
GPS receiver
Accelerometers
RS-232 port
clock
Video-cameras
92
Computer
UTC card
28
94

Fig.6

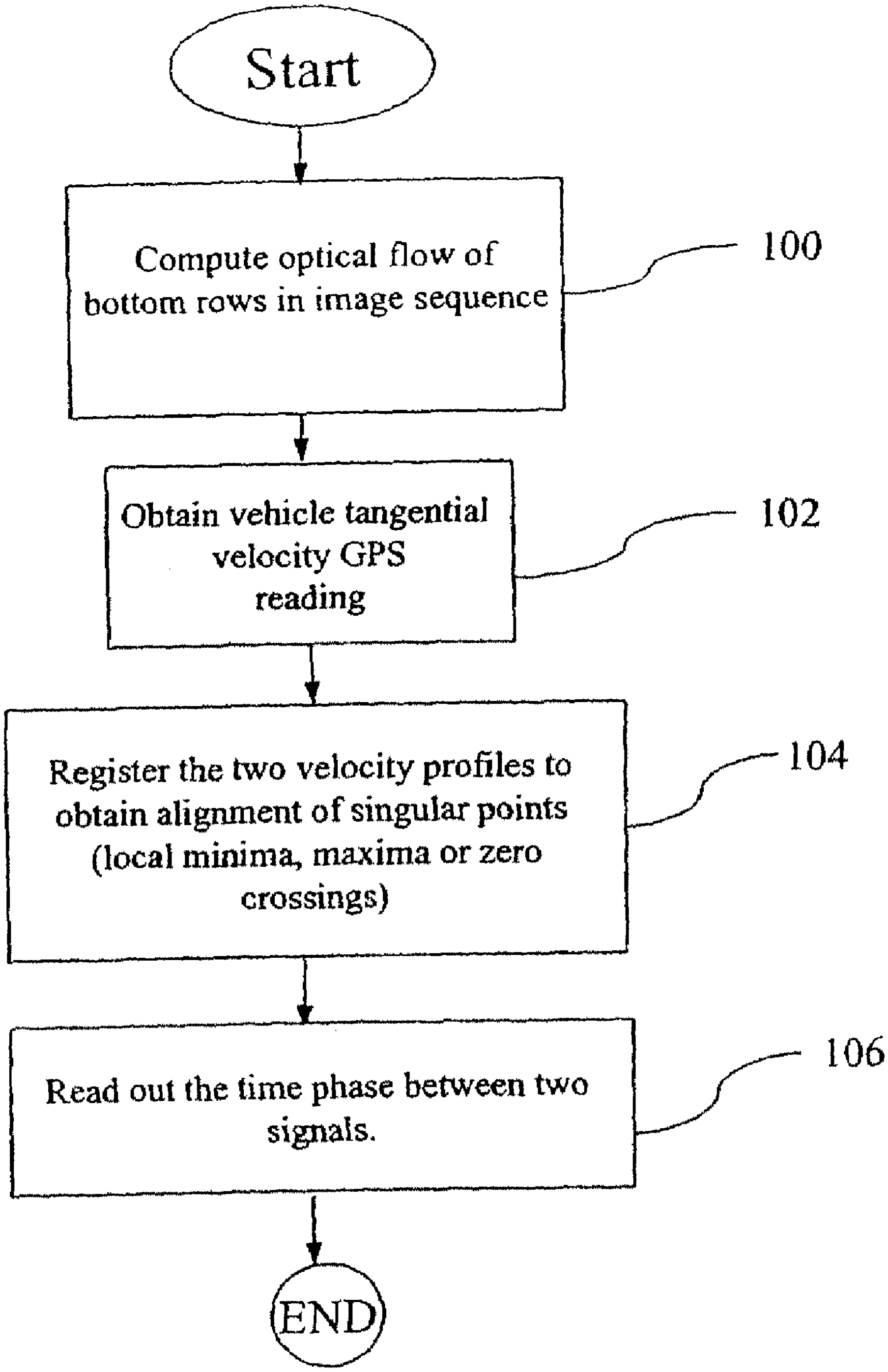

Start
Compute optical flow of bottom rows in image sequence
100
Obtain vehicle tangential velocity GPS reading
102
Register the two velocity profiles to obtain alignment of singular points (local minima, maxima or zero crossings)
104
Read out the time phase between two signals.
106
END

Fig.7

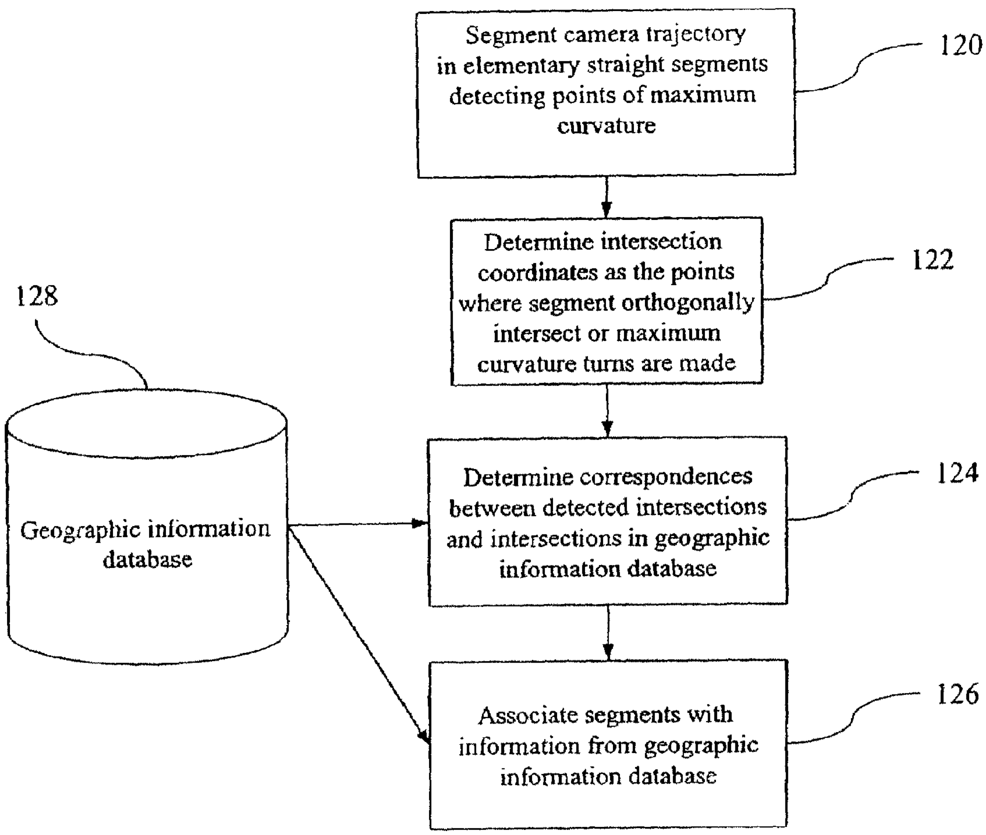

Segment camera trajectory in elementary straight segments detecting points of maximum curvature
120
Determine intersection coordinates as the points where segment orthogonally intersect or maximum curvature turns are made
122
128
Geographic information database
Determine correspondences between detected intersections and intersections in geographic information database
124
Associate segments with information from geographic information database
126

Fig.8

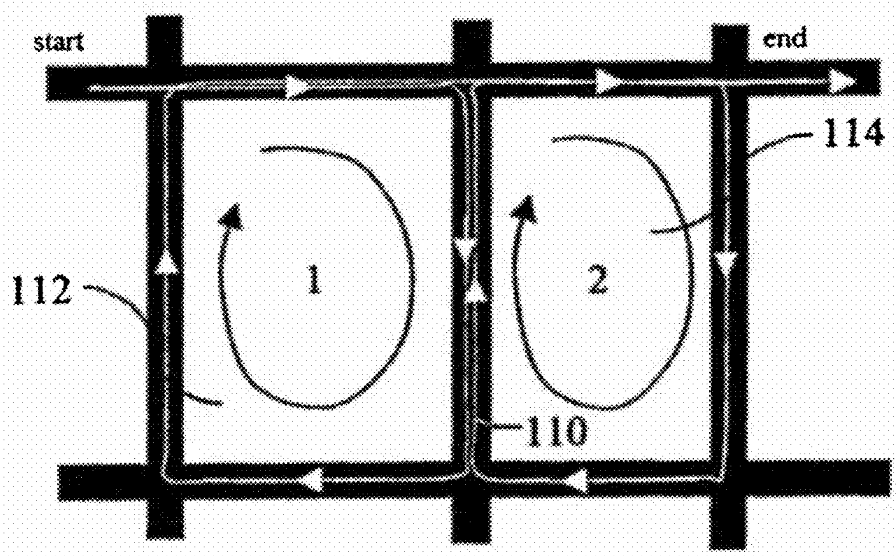


Fig.9

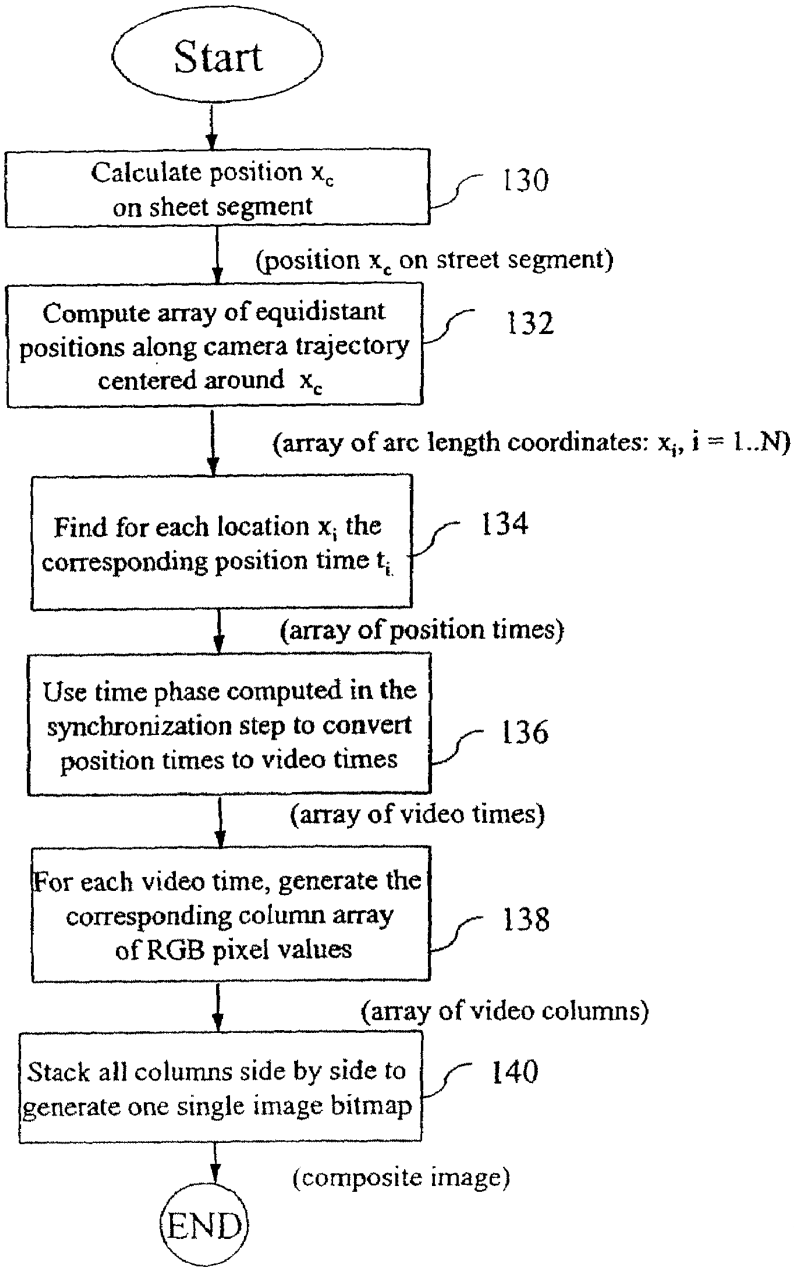

Start
Calculate position x_c on sheet segment
130
(position x_c on street segment)
Compute array of equidistant positions along camera trajectory centered around x_c
132
(array of arc length coordinates: x_i, i = 1..N)
Find for each location x_i the corresponding position time t_i
134
(array of position times)
Use time phase computed in the synchronization step to convert position times to video times
136
(array of video times)
For each video time, generate the corresponding column array of RGB pixel values
138
(array of video columns)
Stack all columns side by side to generate one single image bitmap
140
(composite image)
END

Fig.10

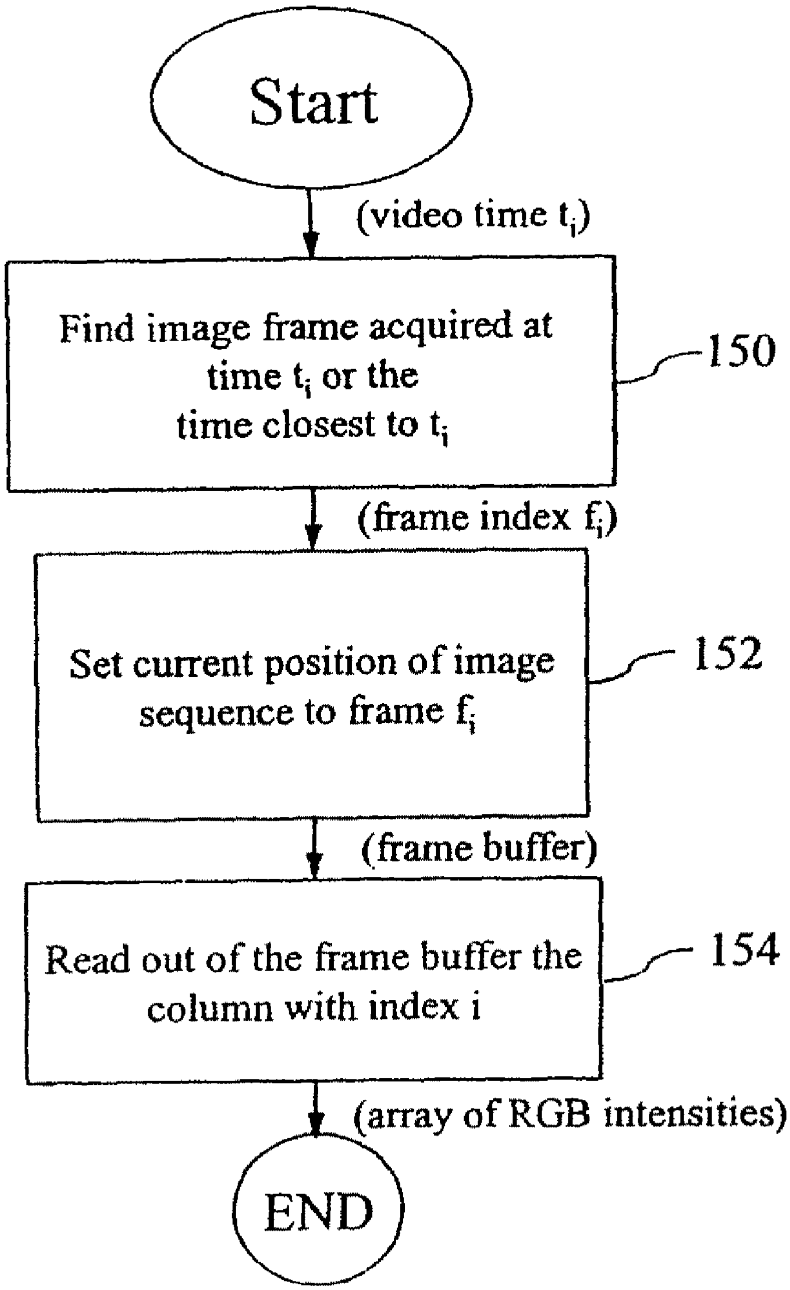

Start
(video time t_i)
Find image frame acquired at time t_i or the time closest to t_i
150
(frame index f_i)
Set current position of image sequence to frame f_i
152
(frame buffer)
Read out of the frame buffer the column with index i
154
(array of RGB intensities)
END

Fig.11

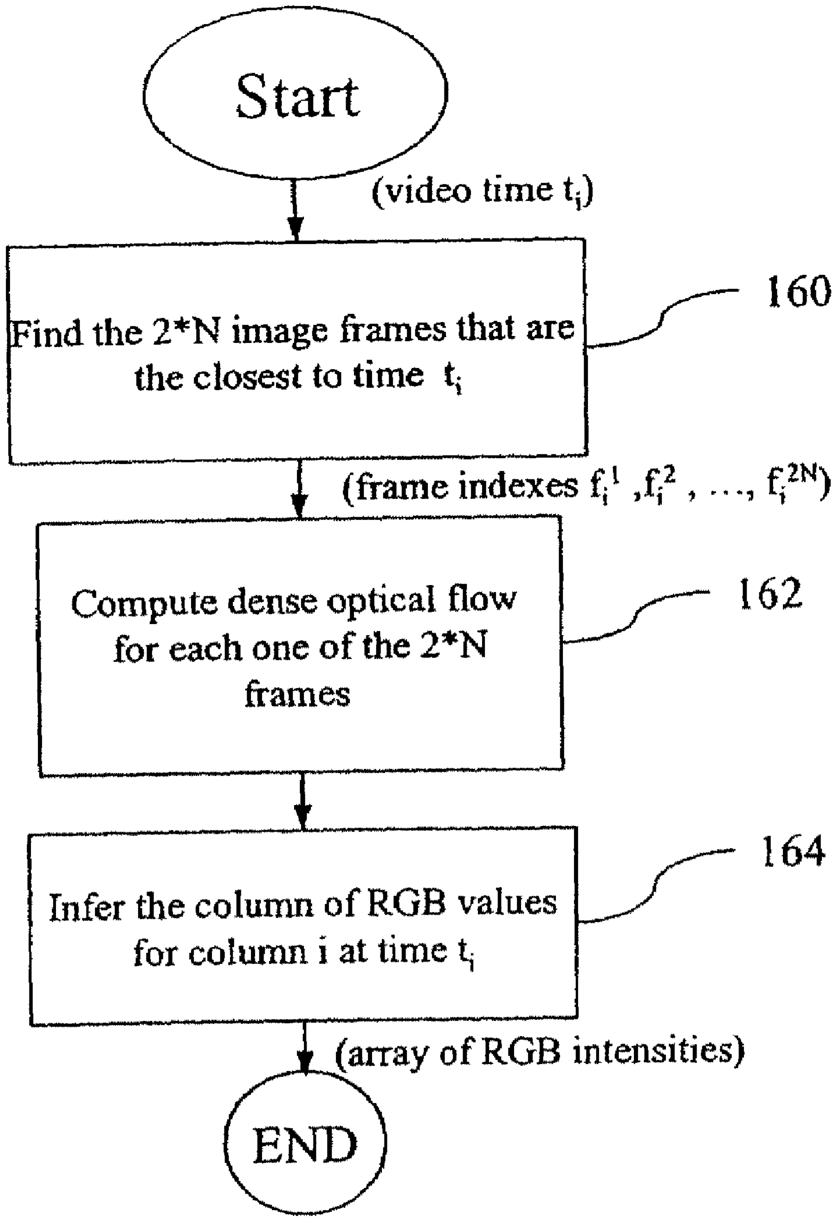

Start
(video time t_i)
Find the 2*N image frames that are the closest to time t_i
160
(frame indexes $f_i^1, f_i^2, \ldots, f_i^{2N}$)
Compute dense optical flow for each one of the 2*N frames
162
Infer the column of RGB values for column i at time t_i
164
(array of RGB intensities)
END

Fig.12

172	174	176	178	180	182	184	186	188
Segment ID	Street Name	Side of Street with Respect to Hub	End Point Coordinates	Segments Adjacent to From Coordinates	Segments Adjacent to To Coordinates	Distance from Hub	Length of Trajectory Segment	Offset
1	Colorado Boulevard	West	(10, 10), (50, 10)	2(N) 4(S) 3(W) 1(E)	5(N) 7(S) 1(W) 6(E)	(120m, 122m)	(28m, 30m)	(2,0)
6	Colorado Boulevard	West	(50, 10) (65,10)	5(N) 7(S) 1(W) 6(E)	8(W) 10(S) 6(W) 9(E)	(130m, 134m)	(20m, 22m)	(0,0)

170

Fig. 13

200

Segment ID (202)	Side Viewed (204)	Distance of Center Position (206)
1	Even	8m
2	Odd	8m
1	Even	16m

Fig. 14

210

Block Label (212)	Segment IDs (214)
(50, 50)	1, 4, 7, 9
(50, 100)	2, 5, 8, 10, 11

Fig. 15

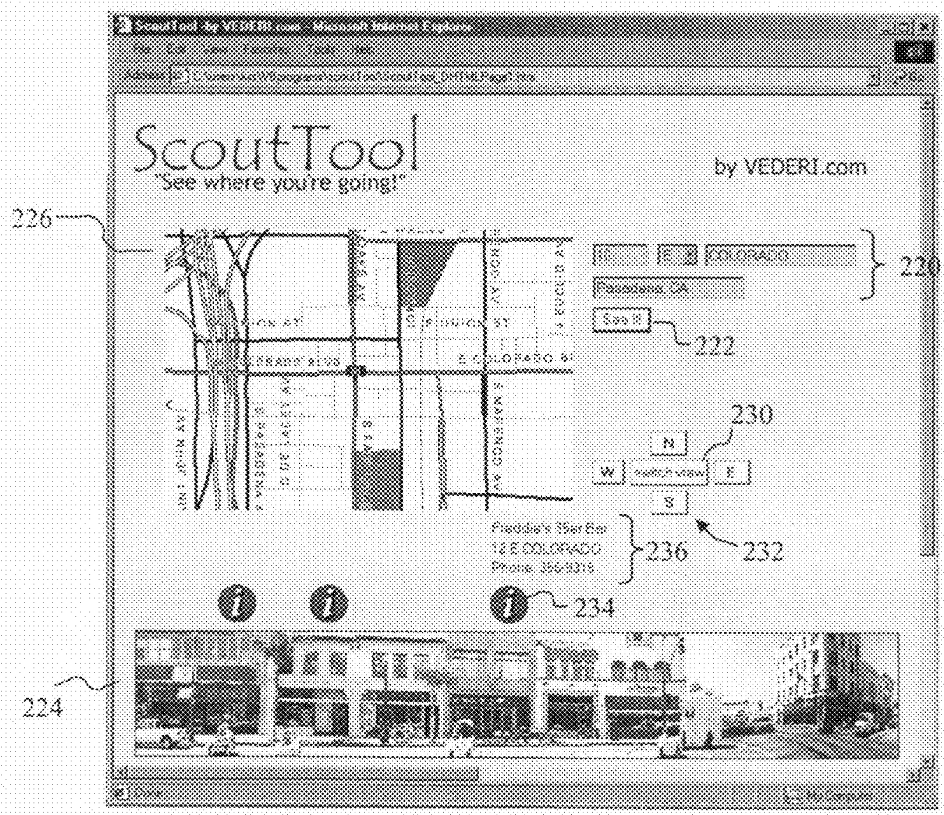

ScoutTool
"See where you're going!"
by VEDERI.com
226
220
222
230
N
W
switch view
E
S
232
236
234
224

Fig.16

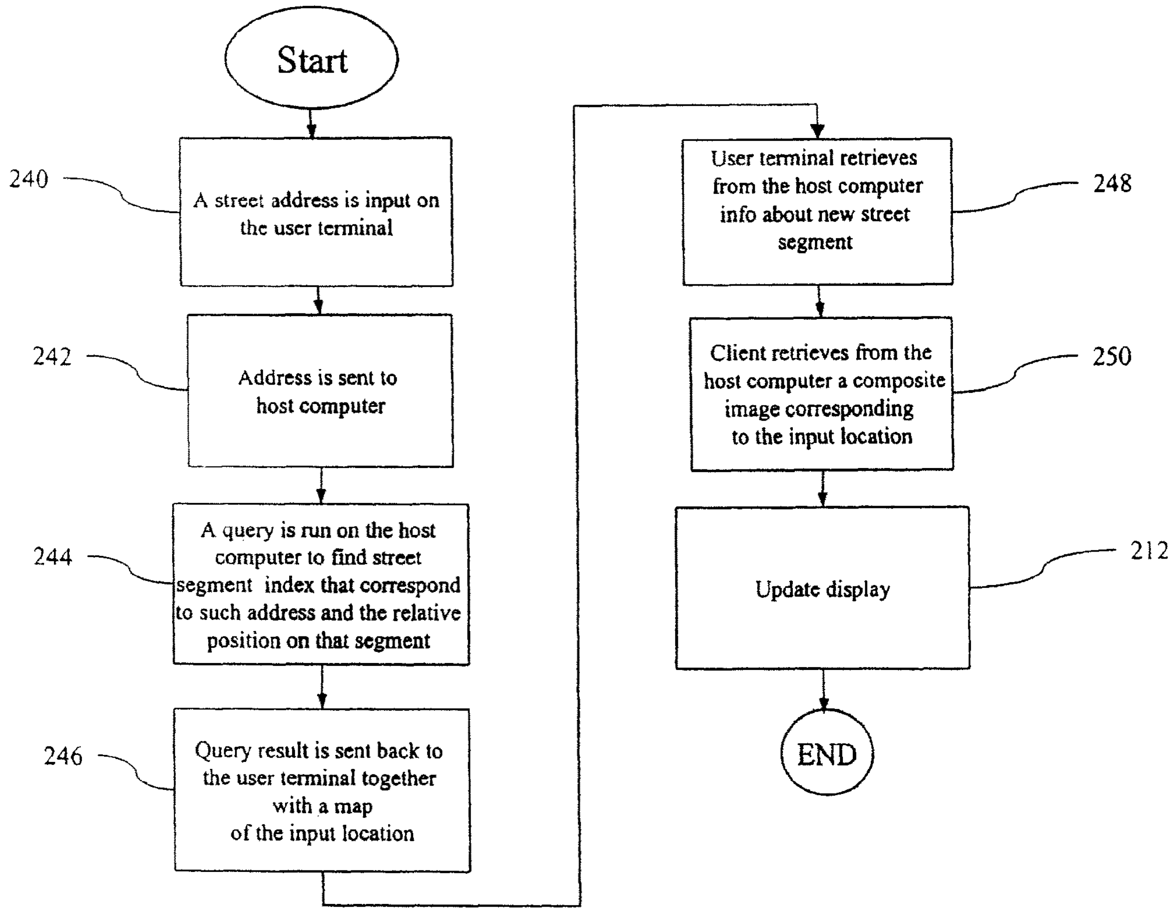
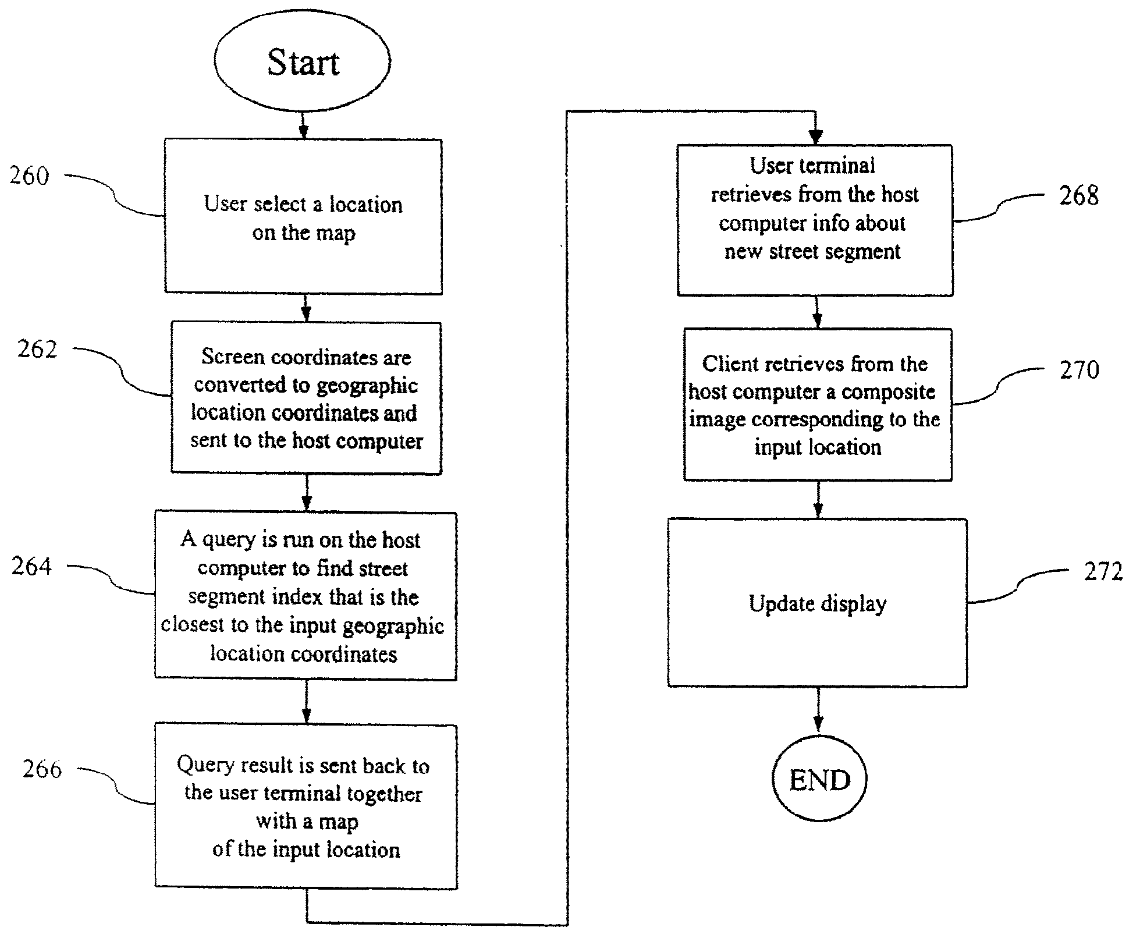

Start
240
A street address is input on the user terminal
242
Address is sent to host computer
244
A query is run on the host computer to find street segment index that correspond to such address and the relative position on that segment
246
Query result is sent back to the user terminal together with a map of the input location
User terminal retrieves from the host computer info about new street segment
248
Client retrieves from the host computer a composite image corresponding to the input location
250
Update display
212
END

Fig.17



Start
260
User select a location on the map
262
Screen coordinates are converted to geographic location coordinates and sent to the host computer
264
A query is run on the host computer to find street segment index that is the closest to the input geographic location coordinates
266
Query result is sent back to the user terminal together with a map of the input location
User terminal retrieves from the host computer info about new street segment
268
Client retrieves from the host computer a composite image corresponding to the input location
270
Update display
272
END

Fig.18

SYSTEM AND METHOD FOR CREATING, STORING AND UTILIZING IMAGES OF A GEOGRAPHIC LOCATION

CROSS-REFERENCE TO RELATED APPLICATION(S)

This application is a continuation application of U.S. application Ser. No. 11/761,361, filed Jun. 11, 2007 now U.S. Pat. No. 7,577,316, which is a continuation of Ser. No. 11/130,004 file May 16, 2005, now U.S. Pat. No. 7,239,760, issued Jul. 3, 2007, which is a divisional of Ser. No. 09/758,717 filed Jan. 11, 2001, now U.S. Pat. No. 6,895,126, issued May 17, 2005, which claims the benefit of U.S. provisional patent application No. 60/238,490, filed Oct. 6, 2000, the disclosures of which are hereby incorporated by reference in their entirety for all purposes.

FIELD OF THE INVENTION

This invention relates to visual databases, specifically to the creation and utilization of visual databases of geographic locations.

BACKGROUND OF THE INVENTION

There exist methods in the prior art for creating visual databases of geographic locations. However, such databases are of limited use due to the method of acquiring the imagery as well as the kind of imagery acquired. One particular method involves the taking of individual photographs of the location and electronically pasting the photographs on a polygonal mesh that provide the framework for a three-dimensional (3D) rendering of the location. This method, however, is time consuming and inefficient for creating large, comprehensive databases covering a substantial geographic area such as an entire city, state, or country.

Another method uses video technology to acquire the images. The use of video technology, especially digital video technology, allows the acquisition of the image data at a higher rate, reducing the cost involved in creating the image databases. For example, the prior art teaches the use of a vehicle equipped with a video camera and a Global Positioning System (GPS) to collect image and position data by driving through the location. The video images are later correlated to the GPS data for indexing the imagery. Nevertheless, such a system is still limited in its usefulness due to the lack of additional information on the imagery being depicted.

The nature of the acquired imagery also limits the usefulness of such a system. A single image acquired by the video camera contains a narrow field of view of a locale (e.g. a picture of a single store-front) due to the limited viewing angle of the video camera. This narrow field of view provides little context for the object/scene being viewed. Thus, a user of such an image database may find it difficult to orient himself or herself in the image, get familiar with the locale, and navigate through the database itself.

One way to increase the field of view is to use a shorter focal length for the video camera, but this introduces distortions in the acquired image. Another method is to increase the distance between the camera and the buildings being filmed. However, this may not be possible due to the limit on the width of the road and constructions on the opposite side of the street.

The prior art further teaches the dense sampling of images of an object/scene to provide different views of the object/scene. The sampling is generally done in two dimensions either within a plane, or on the surface of an imaginary sphere surrounding the object/scene. Such a sampling, however, is computationally intensive and hence cumbersome and inefficient in terms of time and cost.

Accordingly, there is a need for a system and method for creating a visual database of a comprehensive geographic area in a more time and cost efficient manner. Such a system should not require the reconstruction of 3D scene geometry nor the dense sampling of the locale in multiple dimensions. Furthermore, the images in the database should provide a wider field of view of a locale to provide context to the objects being depicted. The database should further correlate the images with additional information related to the geographic location and objects in the location to further enhance the viewing experience.

SUMMARY OF THE INVENTION

The present invention addresses and alleviates the above-mentioned deficiencies associated with the prior art. More particularly, the present invention is directed to a computer-implemented system and method for synthesizing images of a geographic location to generate composite images of the location. The geographic location may be a particular street in a geographic area with the composite images providing a view of the objects on each side of the street.

According to one aspect of the invention, an image recording device moves along a path recording images of objects along the path. A GPS receiver and/or inertial navigation system provides position information of the image recording device as the images are being acquired. The image and position information is provided to a computer to associate each image with the position information.

The computer synthesizes image data from the acquired images to create a composite image depicting a view of the objects from a particular location outside of the path. Preferably, the composite image provides a field of view of the location that is wider than the field of view provided by any single image acquired by the image recording device.

In another aspect of the invention, the path of the camera is partitioned into discrete segments. Each segment is preferably associated with multiple composite images where each composite image depicts a portion of the segment. The composite images and association information are then stored in an image database.

In yet another aspect of the invention, the image database contains substantially all of the static objects in the geographic area allowing a user to visually navigate the area from a user terminal. The system and method according to this aspect of the invention identifies a current location in the geographic area, retrieves an image corresponding to the current location, monitors a change of the current location in the geographic area, and retrieves an image corresponding to the changed location. A map of the location may also be displayed to the user along with information about the objects depicted in the image.

DESCRIPTION OF THE DRAWINGS

FIG. **1** is a schematic block diagram of a data acquisition and processing system for acquiring image and position data used to create composite images of a geographic location;

FIG. **2** is an illustration of a composite image created by the data acquisition and processing system of FIG. **1**;

FIG. **3** is a high-level flow diagram of the steps exercised by the data acquisition and processing system of FIG. **1** in creating and storing the composite images;

FIG. **4** is a flow diagram for synchronizing image sequences with position sequences of a recording camera according to one embodiment of the invention;

FIG. **5** is a flow diagram of an alternative embodiment for synchronizing image sequences with position sequences of a recording camera;

FIG. **6** is a block diagram of the data acquisition and processing system of FIG. **1** allowing a real-time synchronization of image and position data;

FIG. **7** is another embodiment for synchronizing image sequences with position sequences of a recording camera;

FIG. **8** is a flow diagram for segmenting and labeling a camera trajectory;

FIG. **9** is an illustration of a trajectory in a single camera scenario;

FIG. **10** is a flow diagram for creating a composite image of a segment of a camera's path;

FIG. **11** is a flow diagram for identifying and retrieving an optical column from an acquired image according to one embodiment of the invention;

FIG. **12** is a flow diagram for identifying and retrieving an optical column from an acquired image according to an alternative embodiment of the invention;

FIG. **13** is an illustration of an exemplary street segments table including street segments in a camera's trajectory;

FIG. **14** is an illustration of an exemplary image coordinates table for associating composite images with the street segments in the street segments table of FIG. **13**;

FIG. **15** is an illustration of an exemplary segment block table for allowing an efficient determination of a segment that is closest to a particular geographic coordinate;

FIG. **16** is an illustration of an exemplary graphical user interface for allowing the user to place requests and receive information about particular geographic locations;

FIG. **17** is a flow diagram of a process for obtaining image and location information of an express street address; and

FIG. **18** is a flow diagram of the process for obtaining image and location information of a location selected from a map.

DETAILED DESCRIPTION OF THE INVENTION

FIG. **1** is a schematic block diagram of a data acquisition and processing system for acquiring and processing image and position data used to create composite images of a geographic location. The composite images are created by synthesizing individual image frames acquired by a video camera moving through the location and filming the objects in its view. The composite images may depict on urban scene including the streets and structures of an entire city, state, or country. The composite images may also depict other locales such as a zoo, national park, or the inside of a museum, allowing a user to visually navigate the locale.

The data acquisition and processing system includes one or more image recording devices preferably taking the form of digital video cameras **10** moving along a trajectory/path and recording images on the trajectory on digital videotapes **12**. Other types of acquisition devices may also be used in combination to, or in lieu of, the digital cameras **10**, such as analog cameras. Furthermore, the video images may be recorded on optical, magnetic, or silicon video tapes, or on any other known types of storage devices that allow random access of particular image frames and particular video pixels within the image frames.

The data acquisition and processing system further includes a GPS receiver **16** for receiving position information from a set of GPS satellites **18** as the cameras **10** move along the trajectory. An inertial navigation system **20** including one or more accelerometers and/or gyroscopes also provides position information to the data acquisition and processing system. When the inertial navigation system **20** is used in conjunction with the GPS receiver **16**, a more accurate calculation of the position information may be produced.

In an alternative embodiment, position information is acquired using devices other than the inertial navigation system **20** and/or the GPS receiver **16**, such as via computer-vision-based algorithms that compute positions using video information from the video cameras **10**.

The video cameras **10** provide to a multiplexer **22** a frame number and time information for each image acquired via a communication link **24** preferably taking the form of a LANC™ port. The GPS receiver **16** and inertial navigation system **20** also provide position information to the multiplexer **22** via communication links **26*a***, **26*b***, preferably taking the form of RS-232 ports. The multiplexer **22** in turn transmits the received frame number, time information, and position data to a data acquisition computer **34** via a communication link **30**, which also preferably takes the form of an RS-232 port. The computer **34** stores in a trajectory database **36** the position data from the GPS receiver **16** and/or inertial navigation system **20** along with the frame number and time information from the video cameras **10**. This information is then used by a post-processing system **38** to create the composite images.

The post-processing system **38** preferably includes a post-processing computer **28** in communication with a video player **39**. The computer **28** preferably includes a video acquisition card for acquiring and storing the image sequences as the video player **39** plays the videotapes **12** of the acquired images. The computer **28** includes a processor (not shown) programmed with instructions to take the image and position data and create one or more composite images for storing into an image database **32**. The image database **32** is preferably a relational database that resides in a mass storage device taking the form of a hard disk drive or drive array. The mass storage device may be part of the computer **28** or a separate database server in communication with the computer.

In an alternative embodiment, the images are transferred directly to the data acquisition computer **34** as the images are being recorded. In this scenario, the computer **34** is preferably equipped with the video acquisition card and includes sufficient storage space for storing the acquired images. In this embodiment, the data acquisition computer **34** preferably contains program instructions to create the composite images from the acquired images.

In general terms, a composite image of a particular geographic location is created by using at least one video camera **10** recording a series of video images of the location while moving along a path. In the one camera scenario, the camera **10** is moved twice on the same path but in opposite directions to film the objects on both sides of the path. Movement to the camera **10** is provided by a base, platform, or motor vehicle moving at an average speed of preferably about 20 miles/hour to ensure a sufficient resolution in the resulting images. Video cameras with higher sampler rates may allow for faster acquisition speeds.

Preferably, the data acquisition and processing system uses four cameras **10** mounted on top of a moving motor vehicle. Two side cameras face each side of the path for filming objects viewed from the each side of the vehicle. A front and back cameras allow the filming of the objects viewed from the front and back of the vehicle. The front and back cameras may be equipped with fish-eye lens for providing a wide-angle

view of the path. A person skilled in the art should recognize, however, that additional cameras may be used to film the objects from different viewing directions. For example, a duodecahedron of cameras may be used to record the objects from all viewing directions. Furthermore, the side cameras need not face directly to the side of the street, but may face a slightly forward or backward direction to provide a look up or down of the path.

As the images acquired by the cameras **10** are recorded on the videotapes **12**, the frame number and time associated with the images are transferred to the data acquisition computer **34**. The images recorded on the videotapes **12** are later transferred to the post-processing computer **28** for further processing. Once the images are received, the computer **28** stores the image data in its memory in its original form or as a compressed file using one of various well-known compression schemes, such as MPEG.

As the camera **10** moves along the path and records the objects in its view, the GPS receiver **16** computes latitude and longitude coordinates using the information received from the set of GPS satellites **18** at selected time intervals (e.g. one sample every two seconds). The latitude and longitude coordinates indicate the position of the camera **10** during the recording of a particular image frame. The GPS satellite **18** also transmits to the GPS receiver **16** a Universal Time Coordinate (UTC) time of when the coordinates were acquired. The GPS receiver **16** is preferably located on the vehicle transporting the camera **10** or on the camera itself. The GPS data with the position sequences and UTC time information is then transferred to the computer **34** for storing in the trajectory database **36**.

In addition to the position information provided by the GPS receiver **16**, the inertial navigation system **20** also provides acceleration information to the computer **34** for independently deriving the position sequence of the camera **10**. Specifically, the one or more accelerators and gyroscopes in the inertial navigation system **20** monitor the linear and rotational acceleration rates of the camera **10** and transfer the acceleration data to the computer **34**. The computer **34** integrates the acceleration data to obtain the position of the camera **10** as a function of time. The computer **34** preferably combines the position derived from the acceleration information with the GPS position data to produce a more accurate evaluation of the position of the camera **10** at particular instances in time.

The post-processing computer **28** uses the image and position sequences to synthesize the acquired images and create composite images of the location that was filmed. The composite images preferably provide a wider field of view of the location than any single image frame acquired by the camera **10**. In essence, the composite images help provide a panoramic view of the location.

FIG. **2** is an illustration of a composite image **40** created from the image frames **42** acquired by the camera **10** while moving along an x-axis **58** direction. In creating the composite image **40**, the computer assumes a fictitious camera **44** located behind the actual camera **10** and identifies optical rays **46** originating from the fictitious camera. The location of the fictitious camera **44** depends on the desired field of view of the location being filmed. The further away the fictitious camera is placed from the objects along the x-axis **58**, the wider its field of view of the objects.

The computer also identifies optical rays **48** originating from the actual camera **10**. For each optical ray **46** from the fictitious camera **44**, the computer **28** selects an acquired image frame **42** that includes a corresponding optical ray **48** originating from the actual camera **10**. Image data from each selected image frame **42** is then extracted and combined to form the composite image. Preferably, the image data extracted from each image frame is an optical column that consists of a vertical set of pixels. The composite image is preferably created on a column-by-column basis by extracting the corresponding optical column from each image frame. Thus, to create a column Pi **50** in the composite image **40**, the computer locates an image frame **42***a* that was acquired when the camera **10** was located at Xi **52**. To locate this image frame **42***a*, the computer uses the GPS data and/or data from the inertial navigation system **20** to identify a time Ti **54** at which the camera **10** was in the location Xi **52**. Once the image frame **42***a* is identified, the computer **28** extracts the optical column **56** with an index (Pi/N)*M, where N is the total number of columns in the composite image **40** and M is the number of columns in the image frame **42***a*. The composite image **40** is stored in the image database **32**, preferably in JPEG format, and associated with an identifier identifying the particular geographic location depicted in the image. Furthermore, close-ups and fish-eye views of the objects are also extracted from the video sequences using well-known methods, and stored in the image database **32**. The unused data from the acquired images is then preferably deleted from the computer's memory.

FIG. **3** is a high-level flow diagram of the steps exercised by the data acquisition and processing system in creating and storing the composite images. In step **60**, the camera **10** acquires a series of images of a particular geographic location. At the same time, the GPS receiver **16** and/or inertial navigation system **20** acquires the position of the camera **10** while the images are being acquired. Because the time associated with the position information (position time) is likely to differ from the times of acquisition of the video images (video time), the computer **28**, in step **62**, synchronizes the image sequence with the position sequence. The synchronization is preferably a post-processing step that occurs after the image and position sequences have been acquired.

In step **64**, the computer **28** segments the trajectory taken by the recording camera **10** into multiple segments and labels each segment with identifying information about the segment. For example, if the camera traverses through various streets, the computer **28** segments the trajectory into multiple straight street segments and associates each street segment with a street name and number range. In step **66**, the computer **28** generates a series of composite images depicting a portion of each segment, and in step **68**, stores each composite image in the image database **32** along with the identifying information of the segment with which it is associated.

FIG. **4** is a more detailed flow diagram of step **62** for synchronizing the image sequences with the position sequences of the recording camera according to one embodiment of the invention. Although the process illustrated in FIG. **4** assumes that the position data is GPS data, a person skilled in the art should recognize that a similar process may be employed to synchronize the images to positions calculated using the inertial navigation system **20**.

The process starts, and in step **70**, a user of the system selects a landmark in the image sequence that appears in at least two distinct video frames. This indicates that the landmark was recorded once while the camera **10** was moving on one direction on the path, and again while the camera was moving in an opposite direction on the same path. The landmark may be, for example, a tree in a lane divider.

In step **72**, a time interval T is measured in the image sequence between the two passings of the landmark. In step **74**, the computer **28** uses the GPS data to compute a function for determining the time interval between successive passes of any point along the path. The function is then used to find,

for each point x on the path, a time of return Tr(x) which measures the lapse of time between the two passings of each point. In step **76**, a point is identified for which Tr(x)=T. The identified point provides the GPS position of the landmark and hence, a GPS time associated with the landmark. Given the GPS time, a difference between the GPS time and the video time associated with the landmark may be calculated for synchronizing any image frame acquired at a particular video time to the GPS position of the camera at a particular GPS time.

FIG. **5** is a flow diagram of an alternative embodiment for synchronizing the image sequences with GPS position information. As in FIG. **4**, the process illustrated in FIG. **5** also identifies, in step **80**, a landmark in the image sequence that appears in at least two distinct image frames. In step **82**, a time phase is initialized to an arbitrary value using the camera time stamp. In step **84**, the computer **28** measures the distance traveled between the two points on the path that correspond to the time instants in the image sequence where the landmark is seen from the two sides of the path. In step **86**, an inquiry is made as to whether the distance has been minimized. If the answer is NO, the time phase is modified in step **88**, and the process returns to step **84** where the distance is measured again.

In another embodiment, the synchronization does not occur as a post-production process, but occurs in real-time as the image and position sequences are acquired. FIG. **6** is a block diagram of a portion of the data acquisition and processing system of FIG. **1** allowing a real-time synchronization of image and position data. A UTC clock generator **90** provides to the data acquisition computer **34** the UTC time associated with each GPS position of the recording camera **10** as the camera moves along the path. The video time produced by a camera clock **92** is also provided to the data acquisition computer **34** via the communications port **24**. A UTC card **94** on the computer **34** correlates the video time to the UTC time. Thus, the video image acquired at the video time may be correlated to the GPS position of the camera during the recording of the image.

FIG. **7** is yet another embodiment for synchronizing the image sequences with the GPS position of the recording camera **10**. In step **100**, the post-processing computer **28** computes the temporal variation in the image values (i.e. optical flow) of the bottom pixel rows in the image sequence. Thus, the average velocity of each of the pixels in the row may be obtained. In step **102**, the tangential velocity of the camera **10** is obtained from the GPS reading. The average velocity for the computed pixels is directly proportional to the vehicle tangential velocity. Thus, in step **104**, the time phase between the position and video sequences may be determined as a time delay maximizing the alignment of local maxima and local minima between the average pixel velocity and the vehicle tangential velocity. This time phase is then read out in step **106**.

FIG. **8** is a more detailed flow diagram of step **64** of FIG. **3** for segmenting the trajectory followed by one or more recording cameras **10** and labeling the segments with an identifier. In the one camera scenario, the camera is moved along the path making a right turn at each intersection until a block **112** has been filmed, as is illustrated in FIG. **9**. The camera then moves to a second block **114** to film the objects on that block. Thus, a particular path **110** adjoining the two blocks **112**, **114** is traversed twice on opposite directions allowing the filming of the objects on each side of the path.

In step **120**, the post-processing computer **28** segments the camera's trajectory into straight segments by detecting the points of maximum curvature (i.e. where the turns occur). In this regard, the latitude and longitude coordinates provided by the GPS receiver **16** are converted into two-dimensional Mercator coordinates according to well-known methods. A spline interpolation is then obtained from the two-dimensional Mercator coordinates and the resulting spline function is parameterized in arc-length. The computer **28** obtains a new sampling of the coordinates from the spline function by uniformly sampling the coordinates in an arc-length increment of about one meter while detecting the points in the new sequence where a turn was made. The place where a turn occurs is assumed to be the place of an intersection of two segments.

Preferably, the computer **28** performs a singular value decomposition computation according to well-known methods to detect the turns. In this regard, the computer selects an observation window containing N sample points that is moved along the spline for calculating an index indicative of the overall direction (i.e. alignment) of the points in the window. The higher the index, the less aligned the points, and the more likely that the camera was making a turn at those points. The points are least aligned at the center of a turn, and thus, the computer selects as a turn coordinate a point in the observation window where the index is at a local maximum. The computer **28** gathers all the points whose indexes correspond to local maxima and stores them into an array of turn coordinates.

In step **122**, the computer **28** determines the center of an intersection by grouping the turn coordinates into clusters where turns that belong to the same cluster are turns made on the same intersection. An average of the turn coordinates belonging to the same cluster is then calculated and assigned as the intersection coordinate.

The endpoints of each straight segment are identified based on the calculated intersection coordinates. In this regard, an intersection coordinate at the start of the segment is identified and assigned to the segment as a segment start point (the "From" intersection coordinate). An intersection coordinate at the end of the segment is also identified and assigned to the segment as a segment end point (the "To" intersection coordinate).

In the scenario where at least two side cameras are utilized, each camera films the objects on each side of the path during the first pass on the path. Thus, unlike the single camera scenario where a turn is made at each intersection to move the camera along the same path twice but in opposite directions, a turn is not made at each intersection in the two camera scenario. Therefore, instead of identifying the points of maximum curvature for determining the intersection coordinates, the intersection coordinates are simply detected by tracking the GPS data and identifying where the segments orthogonally intersect.

The computer **28** associates the calculated segments with information obtained from a geographic information database **128** and stores it into a segments table as is described in further detail below. In the scenario where composite images of a city are created, the geographic information database **128** includes a map of the city where the endpoints of each street segment on the map are identified by latitude and longitude information. The database **128** further includes a street name and number range for each street segment on the map. Such databases are commercially available from third parties such as Navigation Technologies and Etak, Inc.

In correlating the segments of the camera's trajectory with the segments in the geographic information database **128**, the computer, in step **124**, determines the correspondences between the "From" and "To" coordinates calculated for the trajectory segment with intersection coordinates of the seg-

ments in the database. The computer **28** selects the segment in the geographic information database **128** which endpoints are closest to the computed "From" and "To" coordinates, as the corresponding segment.

In step **126**, the computer labels each trajectory segment with information that is associated with the corresponding segment in the database **128**. Thus, if each segment in the database **128** includes a street name and number, this information is also associated with the trajectory segment.

FIG. **10** is a more detailed flow diagram of step **66** of FIG. **3** for creating a composite image of a segment of the camera's path according to one embodiment of the invention. In step **130**, the computer **28** computes the arc length coordinate Xc of the center of the segment which is then set as the center of the composite image. In step **132**, the computer identifies the optical rays **46** (FIG. **2**) originating from the fictitious camera **44** by computing an array of equidistant positions X**1**, X**2**, . . . , Xn along the camera's trajectory, centered around Xc. The number of computed positions preferably depend on the number of optical columns that are to be created in the composite image.

In step **134**, the computer **28** uses the position information obtained from the GPS receiver **16** and/or inertial navigation system **20** to map each position Xi on the trajectory to a position time Ti. Thus, if GPS data is used to determine the camera's position, each position Xi of the camera **10** is mapped to a UTC time.

In step **136**, the computer **28** uses the time phase information computed in the synchronization step **62** of FIG. **3** to convert the position times to video times. For each identified video time, the computer **28**, in step **138**, identifies an associated image frame and extracts a column of RGB pixel values from the frame corresponding to the optical rays **46** originating from the fictitious camera **44**. In step **140**, the column of RGB pixel values are stacked side by side to generate a single image bitmap forming the composite image.

FIG. **11** is a more detailed flow diagram of step **138** for identifying and retrieving a column of RGB pixel values for a particular video time Ti according to one embodiment of the invention. In step **150**, the computer **28** identifies an image frame with frame index Fi acquired at time Ti. Because the image frames are acquired at a particular frame rate (e.g. one frame every 1/30 seconds), there may be a particular time Ti for which an image frame was not acquired. In this scenario, the frame closest to time Ti is identified according to one embodiment of the invention.

In step **152**, the current position of the image sequence is set to the image frame with index Fi, and the frame is placed into a frame buffer. In step **154**, a column in the image frame with an index i is read out from the frame buffer.

FIG. **12** is a flow diagram of an alternative embodiment for identifying and retrieving a column of RGB pixel values for a particular video time Ti. If an image frame was not acquired at exactly time Ti, the computer, in step **160**, identifies 2*N image frames that are closest to time Ti, where N>1. Thus, at least two image frames closest to time Ti are identified. In step **162**, the computer computes an optical flow field for each of the 2*N image frames and in step **164**, infers the column of RGB values for a column i at time Ti. In the situation where only two image frames are used to compute the optical flow, the computer identifies for each pixel in the first image frame a position X**1** and a position time T**1**. A corresponding pixel in the second frame is also identified along with a position X**2** and a position time T**2**. The position X' of each pixel at time Ti is then computed where X'=X**1**+((T**1**−T**1**)/(T**2**−T**1**))*(X**2**−X**1**). Given the position of each pixel at time Ti, a new frame that corresponds to time Ti may be inferred. The computer **28** may then extract the column of RGB values from the new frame for a column i.

Preferably, the computer **28** creates multiple composite images at uniform increments (e.g. every 8 meters) along a segment. In the scenario where the composite images are created for street segments, the composite images depict the view of the objects on each side of the street. The composite images are then stored in the image database **28** along with various tables that help organize and associate the composite images with street segment information.

According to one embodiment of the invention, the image database **32** includes composite images of a geographic area which together provide a visual representation of at least the static objects in the entire area. Thus, if the geographic area is a particular city, the composite images depict the city on a street-by-street basis, providing a visual image of the buildings, stores, apartments, parks, and other objects on the streets. The system further includes an object information database with information about the objects being depicted in the composite images. If the geographic area being depicted is a city, the object information database contains information about the structures and businesses on each city street. In this scenario, each record in the object information database is preferably indexed by a city address.

FIG. **13** is an illustration of an exemplary street segments table **170** including the street segments in the camera's trajectory. The table **170** suitably includes multiple entries where each entry is a record specific to a particular street segment. A particular street segment record includes an index identifying the street segment (segment ID) **172** as well as the corresponding street name **174** obtained from the geographic information database **128** (FIG. **12**). A particular street segment record also includes the direction of the street (North, South, East, or West) **176** with respect to a main city street referred to as a city hub. The direction information generally appears in an address in front of the street name. A city, state, and/or country fields may also be added to the table **170** depending on the extent of the geographic area covered in the image database **32**.

A street segment record includes the endpoint coordinates **178** of the corresponding street segment in the geographic information database **128**. An array of segment IDs corresponding to street segments adjacent to the segment start point are identified and stored in field **180** along with the direction in which they lie with respect to the start point (e.g. North, South, East, or West). Similarly, an array of segment IDs corresponding to street segments adjacent to the segment end point are also identified and stored in field **182**. These segments are also ordered along the direction in which they lie.

In addition to the above, a street segment record includes a distance of the start of the trajectory segment from the city hub **184**. The city hub generally marks the origin of the streets from which street numbers and street directions (North, South, East, or West) are determined. Street numbers are generally increased by two at uniform distances (e.g. every 12.5 feet) starting from the hub. Thus the distance from the hub allows a computation of the street numbers on the street segment. In a one camera situation where each segment is traversed twice, the distance from the hub is computed for each camera trajectory. In a multiple camera scenario, however, only one distance is computed since the camera traverses the segment only once.

Also included in a street segment record is a length of the trajectory segment. Such a length is computed for each tra-

jectory in a one camera **10** scenario because the movement of the camera **10** is not identical during the two traversals of the segment.

Each street segment record **170** further includes an offset value **188** for each side of the street. The offset is used to correct the street numberings computed based on the distance information. Such a computation may not be accurate if, for instance, there is an unusually wide structure on the segment that is erroneously assigned multiple street numbers because it overlaps into the area of the next number assignment. In this case, the offset is used to decrease the street numbers on the segment by the offset value.

FIG. **14** is an illustration of an exemplary image coordinates table **200** for associating the composite images with the street segments in the street segments table **170**. The image coordinates table **200** includes a plurality of composite image records where each record includes a segment ID **202** of the street segment being depicted in the composite image. In addition, each composite image record includes information of the side of the street segment **204** being depicted. For example, the side may be described as even or odd based on the street numbers on the side of the street being depicted. Each composite image entry also includes a distance from the segment origin to the center Xc of the composite image **206** indicating the position along the street segment for which the image was computed. The distance information is used to retrieve an appropriate composite image for each position on the street segment.

FIG. **15** is an illustration of an exemplary segment block table **210** for allowing an efficient determination of a segment ID that is closest to a particular geographic coordinate. In this regard, the geographic area depicted in the image database **32** is preferably partitioned into a grid of square blocks where each block includes a certain number of street segments. The blocks are assigned block labels preferably corresponding to the center longitude and latitude coordinates of the block. The block labels are stored in a block label field **212**. Associated with each block label are segment IDs **214** corresponding to the street segments in the block. Given the coordinates of a particular geographic location, the block closest to the given coordinates may be identified to limit the search of street segments to only street segments within the block.

In a particular use of the system, a user places inquiries about a location in a geographic area depicted in the image database **32**. For example, the user may enter an address of the location, enter the geographic coordinates of the location, select the location on a map of the geographic area, or specify a displacement from a current location. Preferably, the user has access to a remote terminal that communicates with a host computer to service the user requests. The host computer includes a processor programmed with instructions to access the image database **32** in response to a user request and retrieve composite images about the particular location. The processor is also programmed with instructions to access the geographic and object information databases to retrieve maps and information on the businesses in the geographic area. The retrieved data is then transmitted to the requesting remote user terminal for display thereon.

The remote user terminals may include personal computers, set-top boxes, portable communication devices such as personal digital assistants, and the like. The visual component of each remote user terminal preferably includes a VGA or SVGA liquid-crystal-display (LC) screen, an LED display screen, or any other suitable display apparatus. Pressure sensitive (touch screen) technology may be incorporated into the display screen so that the user may interact with the remote user terminal by merely touching certain portions of the screen. Alternatively, a keyboard, keypad, joystick, mouse, and/or remote control unit is provided to define the user terminal's input apparatus.

Each remote user terminal includes a network interface for communicating with the host computer via wired or wireless media. Preferably, the communication between the remote user terminals and the host computer occurs over a wide area network such as the Internet.

In an alternative embodiment of the invention, the image, geographic information, and object information databases reside locally at the user terminals in a CD, DVD, hard disk drive, or any other type of mass storage media. In this embodiment, the user terminals include a processor programmed with instructions to receive queries from the user about a particular geographic location and retrieve composite images and associated information in response to the user queries.

FIG. **16** is an illustration of an exemplary graphical user interface (GUI) for allowing the user to place requests and receive information about particular geographic locations. The GUI includes address input fields **220** allowing the user to enter the street number, street name, city and state of the particular location he or she desires to view. Actuation of a "See It" button **222** causes the user terminal to transmit the address to the host computer to search the image and geographic location databases **32**, **128** for the composite image and map corresponding to the address. Furthermore, the host computer searches the object information database to retrieve information about the objects depicted in the composite image.

The retrieved composite image and map are respectively displayed on the display screen of the requesting user terminal in a map area **226** and an image area **224**. The map is preferably centered around the requested address and includes a current location cursor **228** placed on a position corresponding to the address. The current location identifier **228** may, for instance, take the shape of an automobile.

The composite image displayed on the image area **224** provides a view of a side of the street (even or odd) based on the entered street number. The user may obtain information about the objects being visualized in the composite image by actuating one of the information icons **234** above the image of a particular object. In displaying the information icons **234**, a range of street addresses for the currently displayed image is computed. The listings in the object information database with street numbers that fall inside the computed range are then selected and associated with the information icons **234** displayed on top of the image of the object.

If the objects are business establishments, the information displayed upon actuating the information icons **234** may include the name, address, and phone number **236** of the establishment. This information is preferably displayed each time the user terminal's cursor or pointing device is passed above the icon. In addition, if the establishment is associated with a particular Web page, the information icon **234** functions as a hyperlink for retrieving and displaying the Web page, preferably on a separate browser window.

The user may obtain a close-up view of a particular object in the composite image by selecting the object in the image. A close-up view of the object is then obtained by computing the distance of the selected object from the origin of the street segment where they object lies. The location on the segment of the closest close-up image is computed and retrieved from the image database **32**. The close-up image is then provided in the image area **224** or in a separate browser window.

A "Switch View" button **230** allows the user to update the current composite image providing a view of one side of the street with a composite image of the other side of the street. In

a multiple camera scenario, each actuation of the "Switch View" button **230** provides a different view of the street. The current view is preferably identified by a direction identifier (not shown) on or close to the current location identifier **228**. For instance, one side of the current location identifier **228** may be marked with a dot or an "X" to identify the side of the street being viewed. Alternatively, an arrow may be placed near the current location identifier **228** to identify the current viewing direction.

The composite image is also updated as the user navigates through the streets using the navigation buttons **232**. From a current location, the user may choose to navigate north, south, west, and east by actuating the corresponding buttons. Preferably, only the navigation buttons corresponding to the possible direction of motions from the current position are enabled. As the user actuates one of the buttons, the current position is incremented by a predetermined amount, currently set to eight meters, to the next available composite image on the current or adjacent segment. The image area **224** is then updated with the new composite image.

FIG. **17** is a flow diagram of the process executed by the host computer for obtaining image and location information of an express street address entered in the address input fields **220**. A similar process is executed by the user terminal in the embodiment where the location and image information are stored locally at the user terminal.

The process starts, and in step **240**, the user requests information about a particular street address by entering the address in the address input fields **220**. In step **242**, the address is transmitted to the host computer preferably over a wide area network such as the Internet. In step **244**, a query is run on the host computer to locate the street segment index in the street segment table **170** (FIG. **13**) corresponding to the requested address. In this regard, the computer searches the street segment table **170** for street segments that match the desired street name **174** as well as a city, state, or country if applicable. For each street segment matching the street name, the computer computes the starting street number on that segment preferably based on the following formula:

$$\text{Start Number}=(\text{round}((\text{Distance from Hub}+\text{Offset})/K)*2)$$

The distance from the hub **184** and offset **188** values are obtained from the street segment table **170**. The value K is the distance assumed between any two street numbers on the segment.

The ending street number on the street segment is also calculated using a similar formula:

$$\text{End Number}=(\text{round}((\text{Distance from Hub}+\text{Offset}+\text{length})/K)*2)$$

The length is the length **186** value obtained from the street segment table **170**.

Once the start and end street numbers are calculated for a particular street segment, the computer determines whether the requested street number lies within the start and end street numbers. If it does, the computer returns the corresponding segment ID **172**. Furthermore, the computer determines the distance of the requested street number from the start of the street segment for determining the position of the street number on the street segment.

In step **246**, the host computer transmits the query result to the requesting user terminal along with a map of the input location retrieved from the geographic information database **128**. In step **248**, the requesting user terminal downloads from the host computer a record from the street segments table **170** corresponding to the identified street segment. Furthermore, the user terminal also retrieves the computed start and end street numbers of the street segment, a list of computed composite images for both sides of the street segment in the image coordinates table **200** (FIG. **14**), and information of the objects visible on the street segment in the object information database.

In step **250**, the user terminal downloads a composite image for the appropriate side of the street from the host computer that has a distance from the origin of the street segment to the center of the composite image **206** (FIG. **14**) that is closest to the distance of the desired street number from the origin. The display on the user terminal is then updated in step **252** with the new location and image information.

FIG. **18** is a flow diagram of the process executed by the host computer for obtaining image and location information of a particular location selected on the map displayed in the map area **226**. A similar process is executed by the user terminal in the embodiment where the location and image information are stored locally at the user terminal.

The process starts, and in step **260**, the user requests information about a particular street address by selecting a location on the map. In step **262**, the map coordinates are converted from screen coordinates to geographic location coordinates (x,y) and transmitted to the host computer preferably over the Internet. In step **244**, a query is run on the host computer to locate the street segment index in the street segment table **170** (FIG. **13**) corresponding to the geographic location coordinates. In this regard, the computer searches the segment block table **210** (FIG. **15**) for a block that includes the street segment corresponding to the input location. In order to locate such a block, the computer rounds the identified geographic location coordinates based preferably on the size of the block. The rounded (x,y) coordinates may thus be represented by ((round (x/B))*B, (round y/B)*B)), where B is the length of one of the block sides. The computer then compares the rounded number to the coordinates stored in the block label field **212** and selects the block with the label field **212** equal to the rounded coordinate. Once the appropriate block is identified, the computer proceeds to retrieve the segment IDs **214** associated with the block. The geographic coordinates of the desired location are then compared with the endpoint coordinates of each street segment in the block for selecting the closest street segment.

In step **266**, the segment ID of the closest street segment is returned to the user terminal. Additionally, a new map of the desired location may be transmitted if the previous map was not centered on the desired location.

In step **268**, the requesting user terminal downloads from the host computer a street segment record in the street segments table **170** corresponding to the identified street segment. The user terminal also retrieves the calculated start and end street numbers of the street segment, a list of computed composite images for both sides of the street the segment in the image coordinates table **200** (FIG. **14**), and information of the objects visible on the street segment in the object information database.

In step **270**, the user terminal downloads the composite image corresponding to the geographic coordinates of the input location. To achieve this, the geographic coordinates are converted to a distance along the identified street segment. The user terminal downloads a composite image that has a distance from the origin of the street segment to the center of the composite image **206** (FIG. **14**) that is closest to the distance of the input location from the origin. The display on the user terminal is then updated in step **272** with the new location and image information.

Although this invention has been described in certain specific embodiments, those skilled in the art will have no difficulty devising variations which in no way depart from the scope and spirit of the present invention. For example, the composite images may be made into streaming video by computing the composite images at small increments along the path (e.g. every 30 cm). Furthermore, the composite images may be computed at several resolutions by moving the fictitious camera **44** (FIG. **2**) closer or further away from the path to decrease or increase its field of view and provide the user with different zoom levels of the image.

Variation may also be made to correct any distortions in the perspective of the composite image along the vertical y-axis direction. The extraction of the optical columns from the acquired image frames may introduce such a distortion since the sampling technique used along the horizontal x-axis direction is not applied along the y-axis. Such a distortion may be corrected by estimating the depth of each pixel in the composite image using optical flow. The aspect ratio of each pixel may be adjusted based on the distance of the object visualized in the pixel. The distortion may also be corrected by acquiring images from an array of two or more video cameras **10** arranged along the vertical y-axis in addition to the cameras in the horizontal axis.

The described method of generating composite images also relies on an assumption that the camera's trajectory is along a straight line. If this is not the case and the vehicle carrying the camera makes a lane change, makes a turn, or passes over a bump, the choice of the optical column extracted from a particular image frame may be incorrect. The distortion due to such deviations from a straight trajectory may, however, be corrected to some degree using optical flow to detect such situations and compensate for their effect.

It is therefore to be understood that this invention may be practiced otherwise than is specifically described. Thus, the present embodiments of the invention should be considered in all respects as illustrative and not restrictive, the scope of the invention to be indicated by the appended claims and their equivalents rather than the foregoing description.

What is claimed is:

1. In a system including an image source and a user terminal having a screen and an input device, a method for enabling visual navigation of a geographic area from the user terminal, the method comprising:

receiving a first user input specifying a first location in the geographic area;

retrieving from the image source a first image associated with the first location, the image source providing a plurality of images depicting views of objects in the geographic area, the views being substantially elevations of the objects in the geographic area, wherein the images are associated with image frames acquired by an image recording device moving along a trajectory;

displaying on the screen a direction identifier for indicating the viewing direction depicted in the first image;

receiving a second user input specifying a navigation direction relative to the first location in the geographic area;

determining a second location based on the user specified navigation direction; and

retrieving from the image source a second image associated with the second location.

2. The method of claim **1** further comprising:

displaying the first image on the screen of the user terminal; and

updating the first image with the second image.

3. The method of claim **1**, wherein the first image depicts a view of the objects in the geographic area from a first viewing direction, and the direction identifier identifies the first viewing direction.

4. The method of claim **3** further comprising:

receiving a user command to change the first viewing direction to a second viewing direction;

retrieving from the image source a third image depicting a view of the objects in the geographic area from the second viewing direction; and

updating the direction identifier for identifying the second viewing direction.

5. The method of claim **1**, wherein the direction identifier is an arrow.

6. The method of claim **1**, wherein the first and second images are each a composite image, wherein each composite image is created based on a first one of the image frames acquired at a first point in the trajectory and a second one of the image frames acquired at a second point in the trajectory.

7. The method of claim **1**, wherein the first and second images are each a composite image, wherein each composite image is created by processing pixel data of a plurality of the image frames.

8. The method of claim **1**, wherein the first and second images each depict a wider field of view than is depicted in any one of the image frames.

9. The method of claim **1** further comprising:

acquiring position information associated with the image recording device as the image recording device moves along the trajectory; and

synchronizing the image frames acquired by the image recording device with the position information.

10. The method of claim **9**, wherein the first and second images are associated to respectively the first and second locations, based on the synchronized position information.

11. The method of claim **1** further comprising:

segmenting the trajectory on which the image recording devices moves, into a plurality of segments;

correlating the plurality of segments to a plurality of street segments in a geographic information database;

identifying one of the plurality of street segments based on the first user input specifying the first location; and

retrieving the first image based on the identified one of the plurality of street segments.

12. The method of claim **11**, wherein the correlating the plurality of segments includes correlating position data of the plurality of segments to position data of the plurality of street segments.

13. In a system including an image source and a user terminal having a screen and an input device, a method for enabling visual navigation of a geographic area from the user terminal, the method comprising:

providing by the image source a plurality of images depicting views of objects in the geographic area, the views being substantially elevations of the objects in the geographic area, wherein the images are associated with image frames acquired by an image recording device moving along a trajectory;

receiving by the user terminal a first user input specifying a first location in the geographic area;

retrieving by the user terminal a first image associated with the first location, the first image being one of the plurality of images provided by the image source;

displaying the first image on the screen of the user terminal;

displaying on the screen a direction identifier for indicating the viewing direction depicted in the first image;

receiving by the user terminal a second user input specifying a navigation direction relative to the first location in the geographic area;

determining a second location based on the user specified navigation direction;

retrieving by the user terminal a second image associated with the second location, the second image being one of the plurality of images provided by the image source; and

updating the first image with the second image.

14. The method of claim **13**, wherein the first image depicts a view of the objects in the geographic area from a first viewing direction, and the direction identifier identifies the first viewing direction.

15. The method of claim **14** further comprising:

receiving by the user terminal a user command to change the first viewing direction to a second viewing direction;

retrieving by the user terminal a third image depicting a view of the objects in the geographic area from the second viewing direction, the third image being one of the plurality of images provided by the image source; and

updating by the user terminal the direction identifier for identifying the second viewing direction.

16. The method of claim **13**, wherein the direction identifier is an arrow.

17. The method of claim **13**, wherein the first and second images each provide a panoramic view of the objects at respectively the first and second locations.

18. The method of claim **13**, wherein the first and second images are each a composite image, wherein each composite image is created based on a first one of the image frames acquired at a first point in the trajectory and a second one of the image frames acquired at a second point in the trajectory.

19. The method of claim **13**, wherein the first and second images are each a composite image, wherein each composite image is created by processing pixel data of a plurality of the image frames.

20. The method of claim **13**, wherein the first and second images each depict a wider field of view than is depicted in any one of the image frames.

21. A method for enabling visual navigation of a geographic area via a computer system coupled to an image source, the computer system including one or more computer devices, at least one of the computer devices having a display screen, the method comprising:

providing by the image source a plurality of images depicting views of objects in the geographic area, the views being substantially elevations of the objects in the geographic area, wherein the images are associated with image frames acquired by an image recording device moving along a trajectory;

receiving by the computer system a first user input specifying a first location in the geographic area;

retrieving by the computer system a first image associated with the first location, the first image being one of the plurality of images provided by the image source;

providing by the computer system the retrieved first image for displaying on a first display area of the display screen;

invoking by the computer system a display of a direction identifier for indicating the viewing direction depicted in the first image;

receiving by the computer system a second user input specifying a navigation direction relative to the first location in the geographic area;

determining by the computer system a second location based on the user specified navigation direction;

retrieving by the computer system a second image associated with the second location, the second image being one of the plurality of images provided by the image source; and

providing by the computer system the retrieved second image for updating the first image with the second image.

22. The method of claim **21**, wherein the first image depicts a view of the objects in the geographic area from a first viewing direction, and the direction identifier identifies the first viewing direction.

23. The method of claim **22** further comprising:

receiving by the computer system a user command to change the first viewing direction to a second viewing direction;

retrieving by the computer system a third image depicting a view of the objects in the geographic area from the second viewing direction, the third image being one of the plurality of images provided by the image source; and

updating by the computer system the direction identifier for identifying the second viewing direction.

24. The method of claim **21**, wherein the direction identifier is an arrow.

25. The method of claim **21**, wherein the first location specified by the first user input is an address specifying information selected from the group consisting of street name, city, state, and zip code.

26. The method of claim **21** further comprising:

invoking by the computer system a display of a navigation button indicating the navigation direction; and

receiving by the computer system user selection of the navigation button.

27. The method of claim **21** further comprising:

receiving by the computer system a user selection associated with a particular one of the objects depicted in the first image; and

invoking by the computer system a display of information on the particular one of the objects in response to the user selection.

28. The method of claim **27**, wherein the particular one of the objects is a retail establishment, the method further comprising:

accessing a web page for the retail establishment; and

invoking by the computer system a display of the web page on the display screen.

29. The method of claim **27** further comprising:

invoking by the computer system a display of an icon in association with the particular one of the objects, wherein the user selection is actuation of the icon.

30. The method of claim **21** further comprising:

invoking by the computer system a display of a map of at least a portion of the geographic area, wherein the direction identifier is displayed on the map.

31. The method of claim **30** further comprising:

invoking by the computer system a display of a location identifier on the map for identifying the location depicted by the first or second image.

32. The method of claim **30** further comprising:

receiving by the computer system a user selection of a location on the displayed map;

retrieving by the computer system a third image associated with the selected location on the map, the third image being one of the plurality of images provided by the image source; and

invoking by the computer system a display of the third image on the display screen.

33. The method of claim **21**, wherein the first and second images each provide a panoramic view of the objects at respectively the first and second locations.

34. The method of claim **21**, wherein the first and second images are each a composite image, wherein each composite image is created based on a first one of the image frames acquired at a first point in the trajectory and a second one of the image frames acquired at a second point in the trajectory.

35. The method of claim **21**, wherein the first and second images are each a composite image, wherein each composite image is created by processing pixel data of a plurality of the image frames.

36. The method of claim **21**, wherein the first and second images each depict a wider field of view than is depicted in any one of the image frames.

37. The method of claim **21** further comprising:

acquiring position information associated with the image recording device as the image recording device moves along the trajectory; and

synchronizing the image frames acquired by the image recording device with the position information.

38. The method of claim **37**, wherein the first and second images are associated to respectively the first and second locations, based on the synchronized position information.

39. The method of claim **21** further comprising:

segmenting the trajectory on which the image recording devices moves, into a plurality of segments;

correlating the plurality of segments to a plurality of street segments in a geographic information database;

identifying one of the plurality of street segments based on the first user input specifying the first location; and

retrieving the first image based on the identified one of the plurality of street segments.

40. The method of claim **39**, wherein the correlating the plurality of segments includes correlating position data of the plurality of segments to position data of the plurality of street segments.

41. The method of claim **21**, wherein the one or more computer devices includes a server.

42. The method of claim **21**, wherein the one or more computer devices includes a user terminal.

43. A user terminal coupled to an image source for visually navigating a geographic area, the user terminal including:

a display screen;

a processor coupled to the display screen; and

a memory coupled to the processor and storing computer program instructions therein, the processor configured to execute the computer program instructions, the computer program instructions including:

receiving a first user input specifying a first location in the geographic area;

retrieving from the image source a first image associated with the first location, the image source providing a plurality of images depicting views of objects in the geographic area, the views being substantially elevations of the objects in the geographic area, wherein the images are associated with image frames acquired by an image recording device moving along a trajectory;

displaying on the display screen a direction identifier for indicating the viewing direction depicted in the first image;

receiving a second user input specifying a navigation direction relative to the first location in the geographic area;

determining a second location based on the user specified navigation direction;

retrieving from the image source a second image associated with the second location; and

updating the first image with the second image.

44. The user terminal of claim **43**, wherein the first image depicts a view of the objects in the geographic area from a first viewing direction, and the direction identifier identifies the first viewing direction.

45. The user terminal of claim **44**, wherein the computer program instructions further include:

receiving a user command to change the first viewing direction to a second viewing direction;

retrieving from the image source a third image depicting a view of the objects in the geographic area from the second viewing direction; and

updating the direction identifier for identifying the second viewing direction.

46. The user terminal of claim **44**, wherein the direction identifier is an arrow.

47. The user terminal of claim **43**, wherein the first location specified by the first user input is an address specifying information selected from the group consisting of street name, city, state, and zip code.

48. The user terminal of claim **43**, wherein the computer program instructions further include:

displaying a navigation button indicating the navigation direction; and

receiving user selection of the navigation button.

49. The user terminal of claim **43**, wherein the computer program instructions further include:

receiving a user selection associated with a particular one of the objects depicted in the first image; and

displaying information on the particular one of the objects in response to the user selection.

50. The user terminal of claim **49**, wherein the particular one of the objects is a retail establishment, and the computer program instructions further include:

accessing a web page for the retail establishment; and

displaying the web page on the display screen.

51. The user terminal of claim **49**, wherein the computer program instructions further include:

displaying an icon in association with the particular one of the objects, wherein the user selection is actuation of the icon.

52. The user terminal of claim **43**, wherein the computer program instructions further include:

displaying a map of at least a portion of the geographic area, wherein the direction identifier is displayed on the map.

53. The user terminal of claim **52**, wherein the computer program instructions further include:

displaying on the map a location identifier identifying the location depicted by the first or second image.

54. The user terminal of claim **52**, wherein the computer program instructions further include:

receiving a user selection of a location on the displayed map;

retrieving from the image source a third image associated with the selected location on the map; and

displaying the third image on the display screen.

55. A system for enabling visual navigation of a geographic area, the system comprising:

an image source providing a plurality of images depicting views of objects in the geographic area, the views being substantially elevations of the objects in the geographic

area, wherein the images are associated with image frames acquired by an image recording device moving along a trajectory; and

one or more computer devices coupled to the image source, at least one of the computer devices having a display screen, the one or more computer devices being configured to execute computer program instructions including:

receiving a first user input specifying a first location in the geographic area;

retrieving a first image associated with the first location, the first image being one of the plurality of images provided by the image source;

providing the retrieved first image for displaying on a first display area of the display screen;

invoking display of a direction identifier for indicating the viewing direction depicted in the first image;

receiving a second user input specifying a navigation direction relative to the first location in the geographic area;

determining a second location based on the user specified navigation direction;

retrieving a second image associated with the second location, the second image being one of the plurality of images provided by the image source; and

providing the retrieved second image for updating the first image with the second image.

56. The system of claim **55**, wherein the first image depicts a view of the objects in the geographic area from a first viewing direction, and the direction identifier identifies the first viewing direction.

57. The system of claim **56**, wherein the computer program instructions further include:

receiving a user command to change the first viewing direction to a second viewing direction;

retrieving a third image depicting a view of the objects in the geographic area from the second viewing direction, the third image being one of the plurality of images provided by the image source; and

updating the direction identifier for identifying the second viewing direction.

58. The system of claim **55**, wherein the direction identifier is an arrow.

59. The system of claim **55**, wherein the first location specified by the first user input is an address specifying information selected from the group consisting of street name, city, state, and zip code.

60. The system of claim **55**, wherein the computer program instructions further include:

invoking display of a navigation button indicating the navigation direction; and

receiving user selection of the navigation button.

61. The system of claim **55**, wherein the computer program instructions further include:

receiving a user selection associated with a particular one of the objects depicted in the first image; and

invoking display of information on the particular one of the objects in response to the user selection.

62. The system of claim **61**, wherein the particular one of the objects is a retail establishment, the method further comprising:

accessing a web page for the retail establishment; and

invoking display of the web page on the display screen.

63. The system of claim **61**, wherein the computer program instructions further include:

invoking display of an icon in association with the particular one of the objects, wherein the user selection is actuation of the icon.

64. The system of claim **55**, wherein the computer program instructions further include:

invoking by the computer system display of a map of at least a portion of the geographic area, wherein the direction identifier is displayed on the map.

65. The system of claim **64**, wherein the computer program instructions further include:

invoking display of a location identifier on the map for identifying the location depicted by the first or second image.

66. The system of claim **64**, wherein the computer program instructions further include:

receiving a user selection of a location on the displayed map;

retrieving a third image associated with the selected location on the map, the third image being one of the plurality of images provided by the image source; and

invoking display of the third image on the display screen.

67. The system of claim **55**, wherein the first and second images each provide a panoramic view of the objects at respectively the first and second locations.

68. The system of claim **55**, wherein the first and second images are each a composite image, wherein each composite image is created based on a first one of the image frames acquired at a first point in the trajectory and a second one of the image frames acquired at a second point in the trajectory.

69. The system of claim **55**, wherein the first and second images are each a composite image, wherein each composite image is created by processing pixel data of a plurality of the image frames.

70. The system of claim **55**, wherein the first and second images each depict a wider field of view than is depicted in any one of the image frames.

71. The system of claim **55**, wherein the computer program instructions further include:

acquiring position information associated with the image recording device as the image recording device moves along the trajectory; and

synchronizing the image frames acquired by the image recording device with the position information.

72. The system of claim **71**, wherein the first and second images are associated to respectively the first and second locations, based on the synchronized position information.

73. The system of claim **55**, wherein the computer program instructions further include:

segmenting the trajectory on which the image recording devices moves, into a plurality of segments;

correlating the plurality of segments to a plurality of street segments in a geographic information database;

identifying one of the plurality of street segments based on the first user input specifying the first location; and

retrieving the first image based on the identified one of the plurality of street segments.

74. The system of claim **73**, wherein the correlating the plurality of segments includes correlating position data of the plurality of segments to position data of the plurality of street segments.

* * * * *

UNITED STATES PATENT AND TRADEMARK OFFICE

CERTIFICATE OF CORRECTION

PATENT NO. : 7,805,025 B2
APPLICATION NO. : 12/482314
DATED : September 28, 2010
INVENTOR(S) : Enrico DiBernardo et al.

It is certified that error appears in the above-identified patent and that said Letters Patent is hereby corrected as shown below:

On the Title Page

(57) Abstract, line 2	Delete "provide" Insert -- provides --

In the Claims

Column 16, Claim 11, line 38	Delete "devices" Insert -- device --
Column 19, Claim 39, line 29	Delete "devices" Insert -- device --
Column 22, Claim 73, line 52	Delete "devices" Insert -- device --

Signed and Sealed this
Twelfth Day of April, 2011

David J. Kappos
Director of the United States Patent and Trademark Office

US007813596B2

(12) **United States Patent**
Di Bernardo et al.

(10) **Patent No.: US 7,813,596 B2**
(45) **Date of Patent: *Oct. 12, 2010**

(54) **SYSTEM AND METHOD FOR CREATING, STORING AND UTILIZING IMAGES OF A GEOGRAPHIC LOCATION**

(75) Inventors: **Enrico Di Bernardo**, Pasadena, CA (US); **Luis F. Goncalves**, South Pasadena, CA (US)

(73) Assignee: **Vederi, LLC**, Pasadena, CA (US)

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 0 days.

This patent is subject to a terminal disclaimer.

(21) Appl. No.: **12/482,284**

(22) Filed: **Jun. 10, 2009**

(65) **Prior Publication Data**

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Related U.S. Application Data

(60) Continuation of application No. 11/761,361, filed on Jun. 11, 2007, now Pat. No. 7,577,316, which is a continuation of application No. 11/130,004, filed on May 16, 2005, now Pat. No. 7,239,760, which is a division of application No. 09/758,717, filed on Jan. 11, 2001, now Pat. No. 6,895,126.

(60) Provisional application No. 60/238,490, filed on Oct. 6, 2000.

(51) **Int. Cl.**

G06K 9/60	(2006.01)
G08G 1/123	(2006.01)
H04N 7/00	(2006.01)
G01C 21/00	(2006.01)

(52) **U.S. Cl.** **382/305**; 340/995.1; 348/113; 701/200

(58) **Field of Classification Search** 382/104, 382/113, 291, 305, 312; 715/850, 851, 854, 715/855; 701/200–215; 340/995.1–995.26; 342/357.12, 357.13; 370/316

See application file for complete search history.

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Primary Examiner—Kanji Patel
(74) *Attorney, Agent, or Firm*—Christie, Parker & Hale, LLP

(57) **ABSTRACT**

A system and method synthesizing images of a locale to generate a composite image that provide a panoramic view of the locale. A video camera moves along a street recording images of objects along the street. A GPS receiver and inertial navigation system provide the position of the camera as the images are being recorded. The images are indexed with the position data provided by the GPS receiver and inertial navigation system. The composite image is created on a column-by-column basis by determining which of the acquired images contains the desired pixel column, extracting the pixels associated with the column, and stacking the columns side by side. The composite images are stored in an image database and associated with a street name and number range of the street being depicted in the image. The image database covers a substantial amount of a geographic area allowing a user to visually navigate the area from a user terminal.

62 Claims, 18 Drawing Sheets

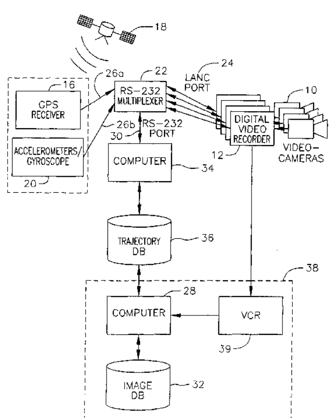

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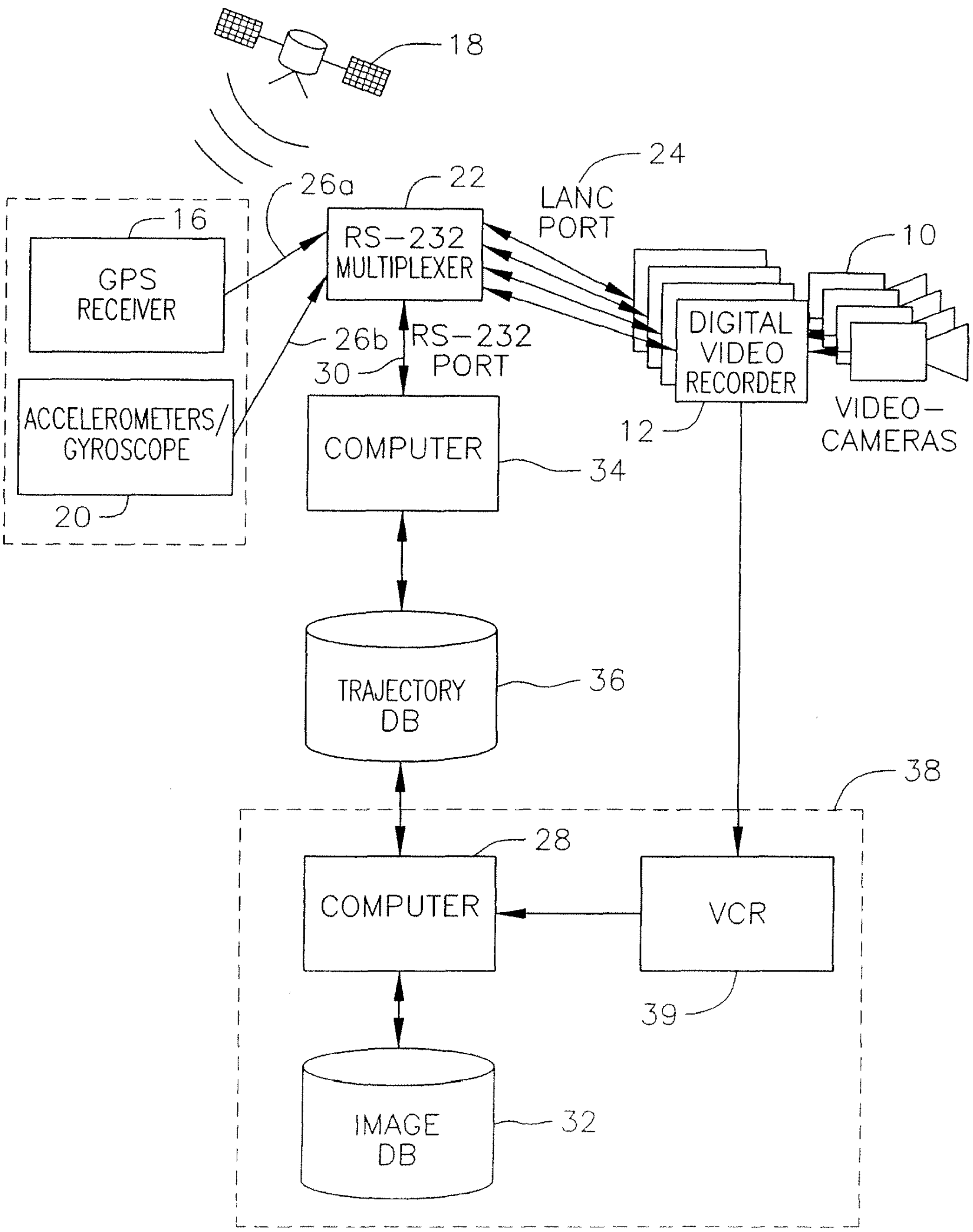
FIG.1


18
24
LANC PORT
22
26a
16
GPS RECEIVER
RS-232 MULTIPLEXER
10
DIGITAL VIDEO RECORDER
26b
RS-232 PORT
30
ACCELEROMETERS/ GYROSCOPE
COMPUTER
12
VIDEO-CAMERAS
34
20
TRAJECTORY DB
36
38
28
COMPUTER
VCR
39
IMAGE DB
32

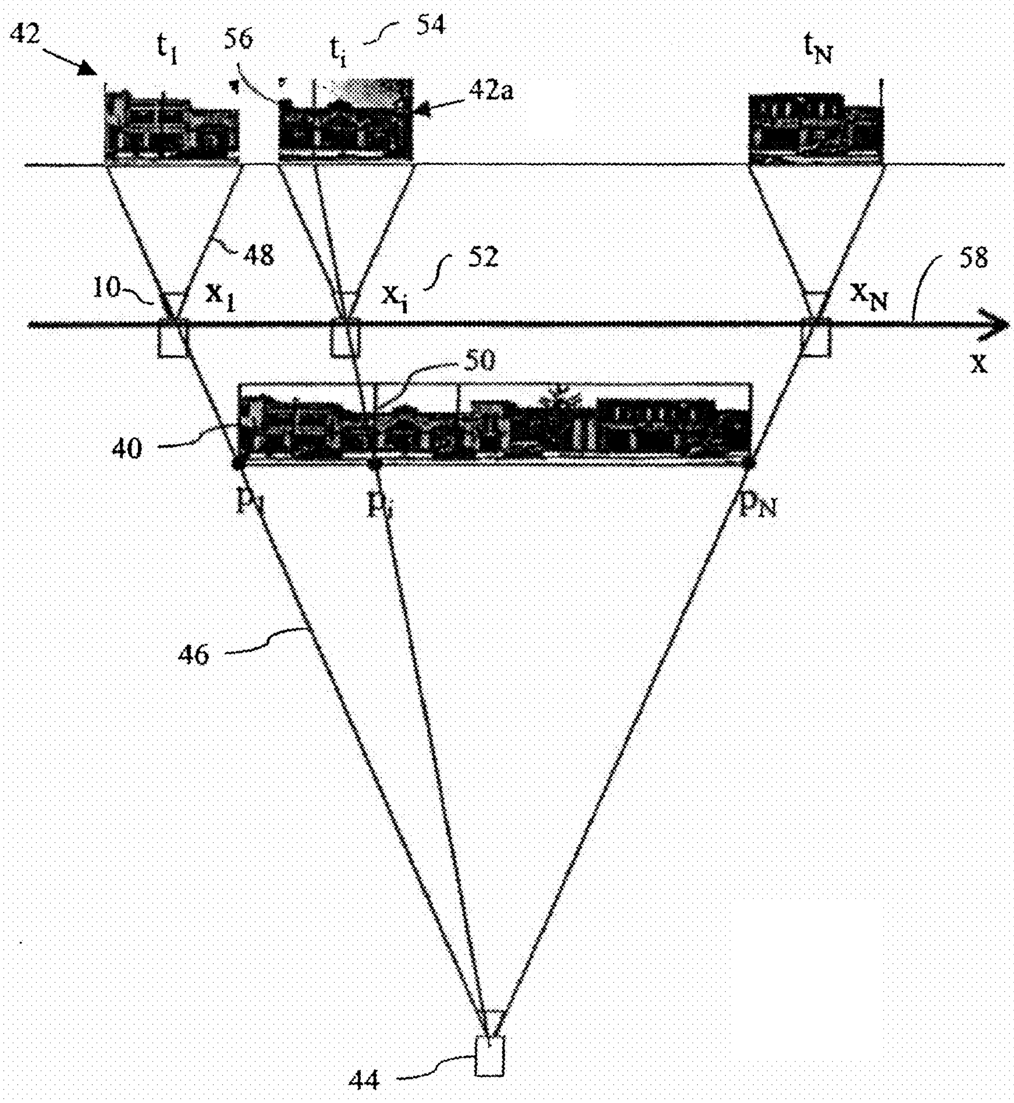


Fig.2

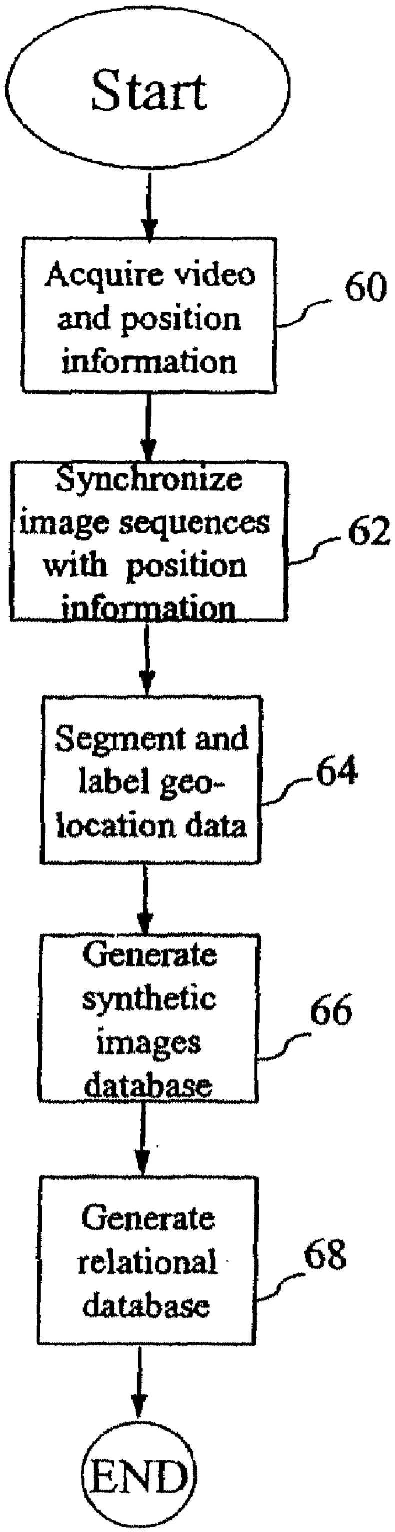

Start
Acquire video and position information
60
Synchronize image sequences with position information
62
Segment and label geo-location data
64
Generate synthetic images database
66
Generate relational database
68
END

Fig.3

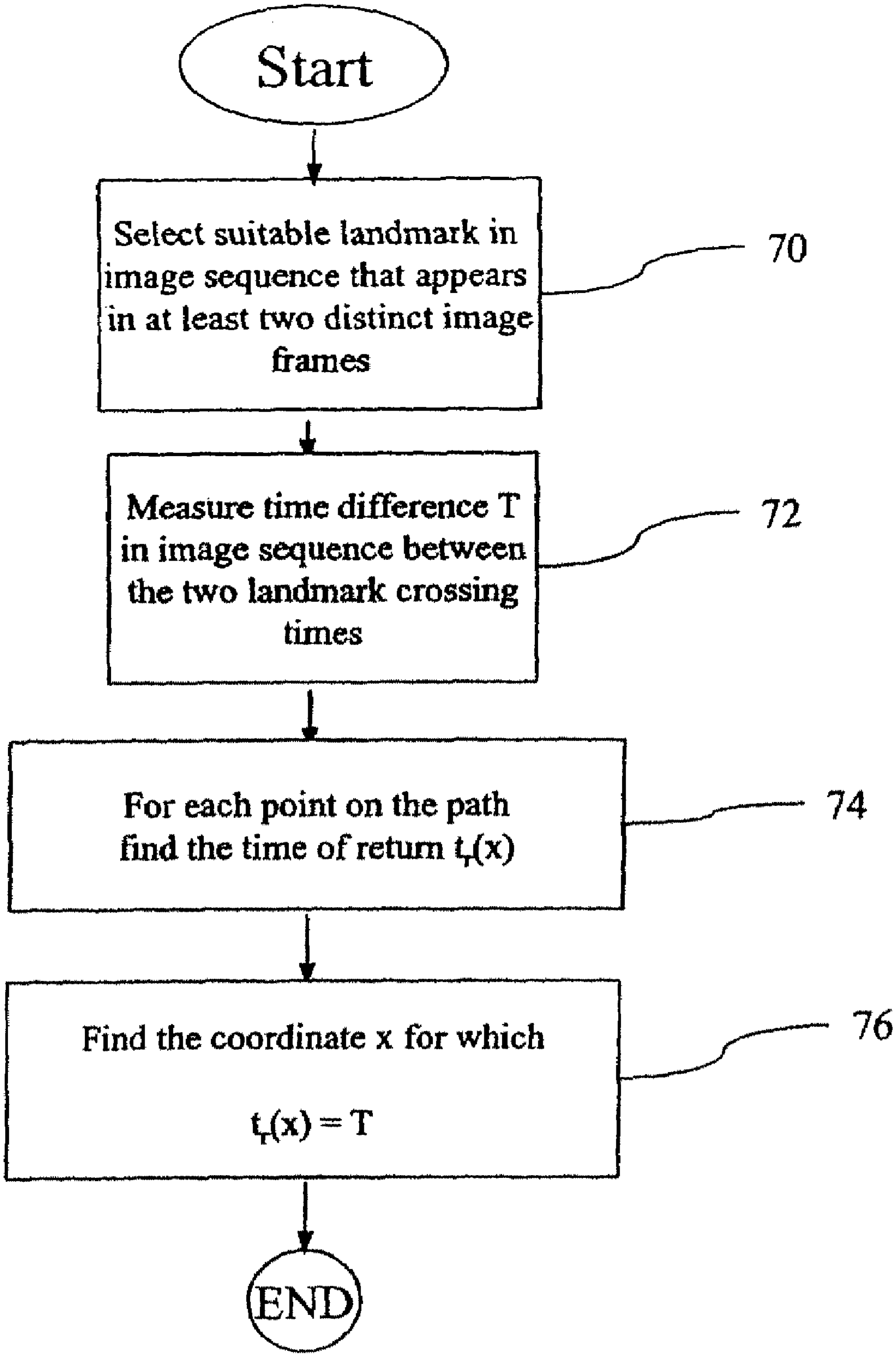

Start
Select suitable landmark in image sequence that appears in at least two distinct image frames
70
Measure time difference T in image sequence between the two landmark crossing times
72
For each point on the path find the time of return $t_r(x)$
74
Find the coordinate x for which
$t_r(x) = T$
76
END

Fig.4

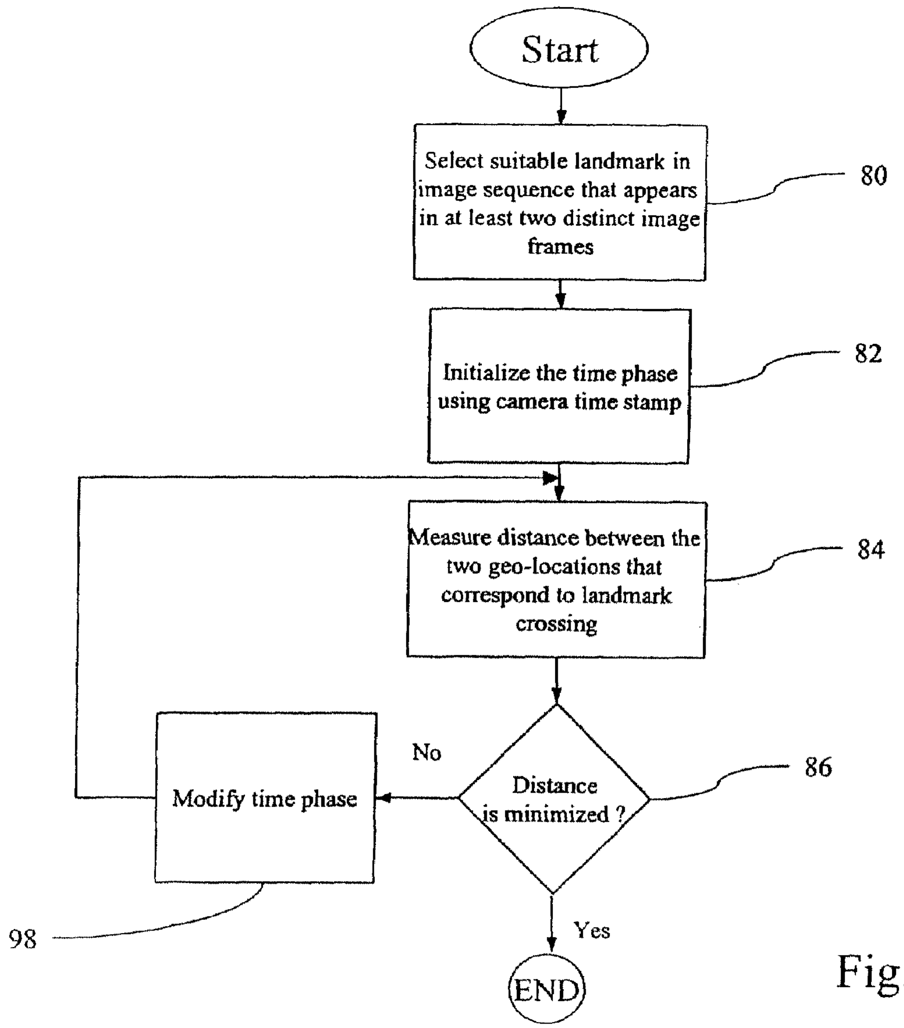

Start
Select suitable landmark in image sequence that appears in at least two distinct image frames
80
Initialize the time phase using camera time stamp
82
Measure distance between the two geo-locations that correspond to landmark crossing
84
Distance is minimized ?
86
No
Modify time phase
98
Yes
END

Fig.5

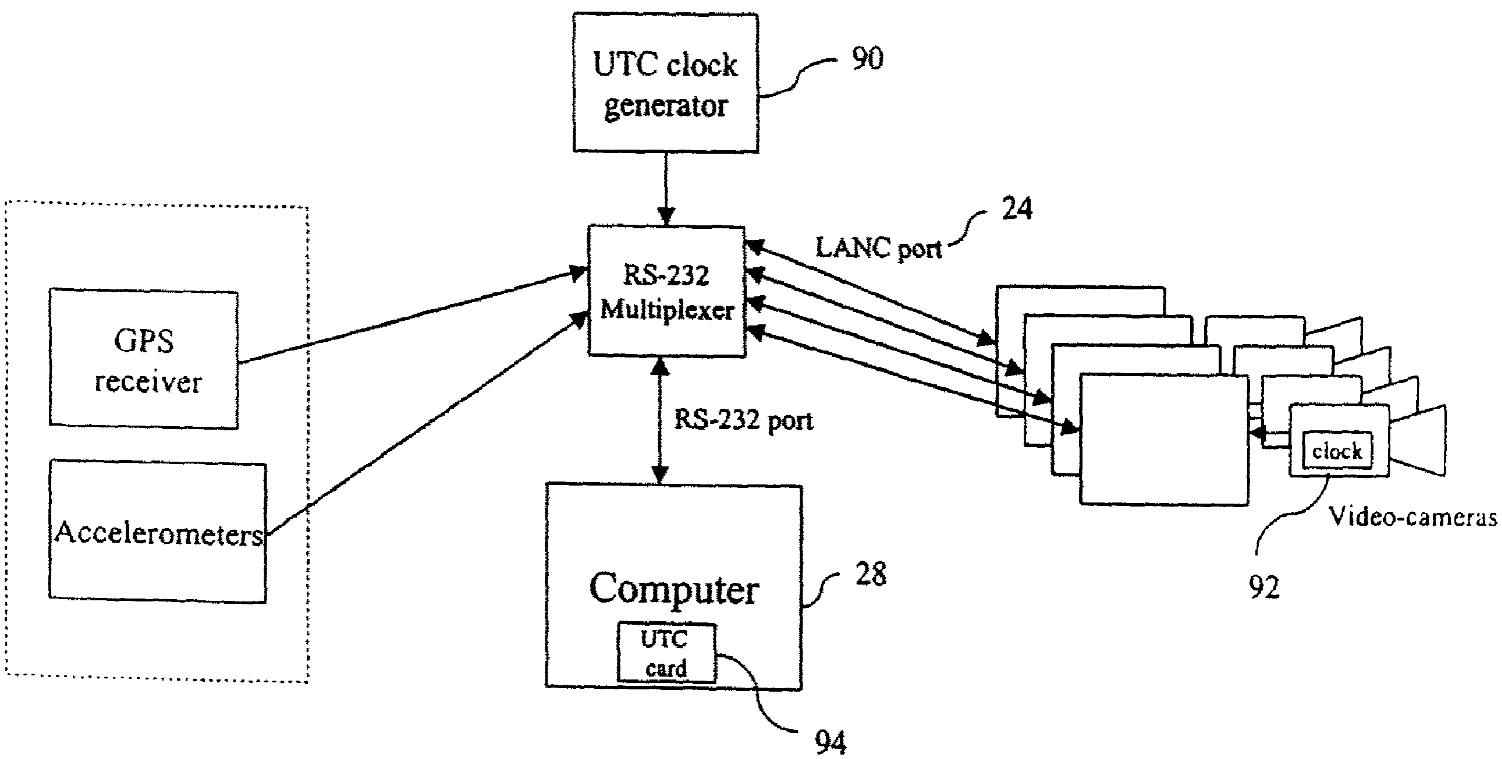

UTC clock generator
90
RS-232 Multiplexer
LANC port
24
GPS receiver
Accelerometers
RS-232 port
Computer
UTC card
28
94
clock
Video-cameras
92

Fig.6

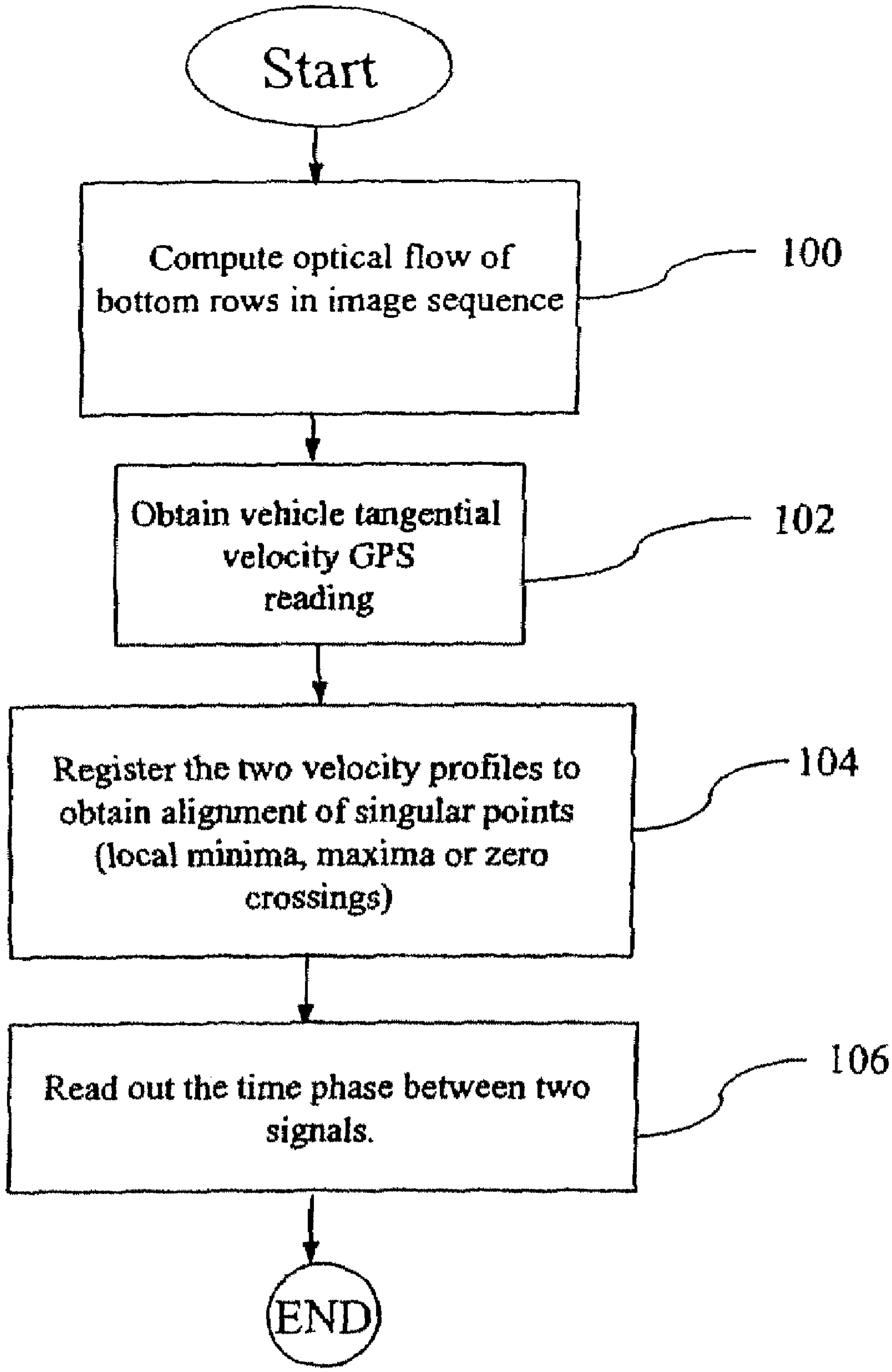

Start
Compute optical flow of bottom rows in image sequence
100
Obtain vehicle tangential velocity GPS reading
102
Register the two velocity profiles to obtain alignment of singular points (local minima, maxima or zero crossings)
104
Read out the time phase between two signals.
106
END

Fig.7

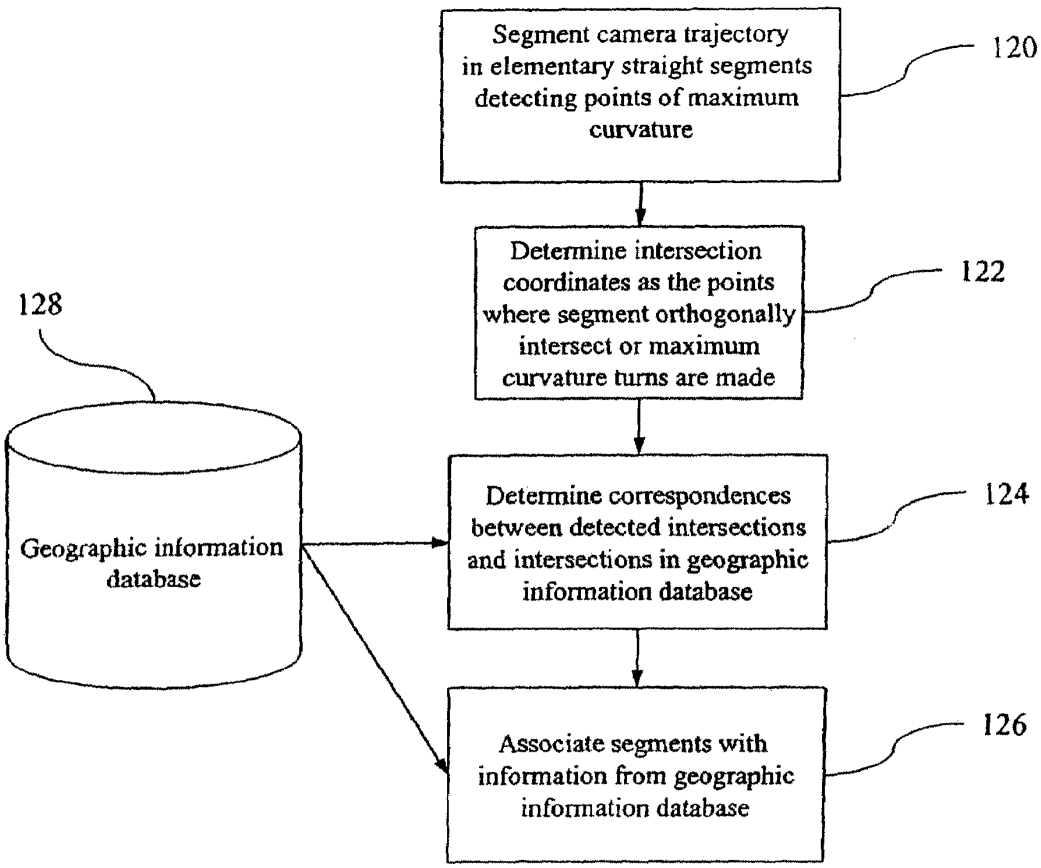

Segment camera trajectory in elementary straight segments detecting points of maximum curvature
120
Determine intersection coordinates as the points where segment orthogonally intersect or maximum curvature turns are made
122
128
Geographic information database
Determine correspondences between detected intersections and intersections in geographic information database
124
Associate segments with information from geographic information database
126

Fig.8

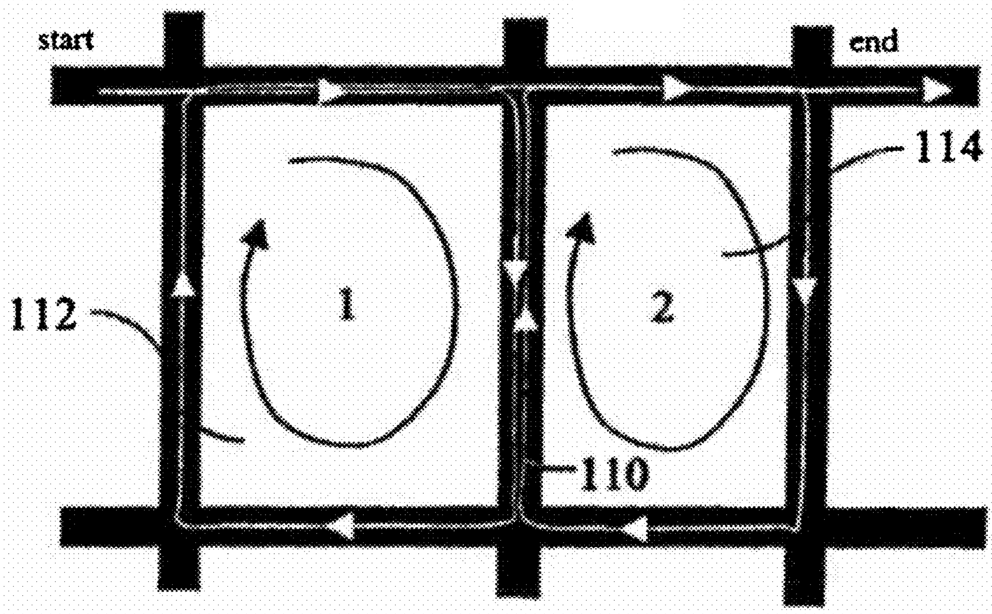


Fig.9

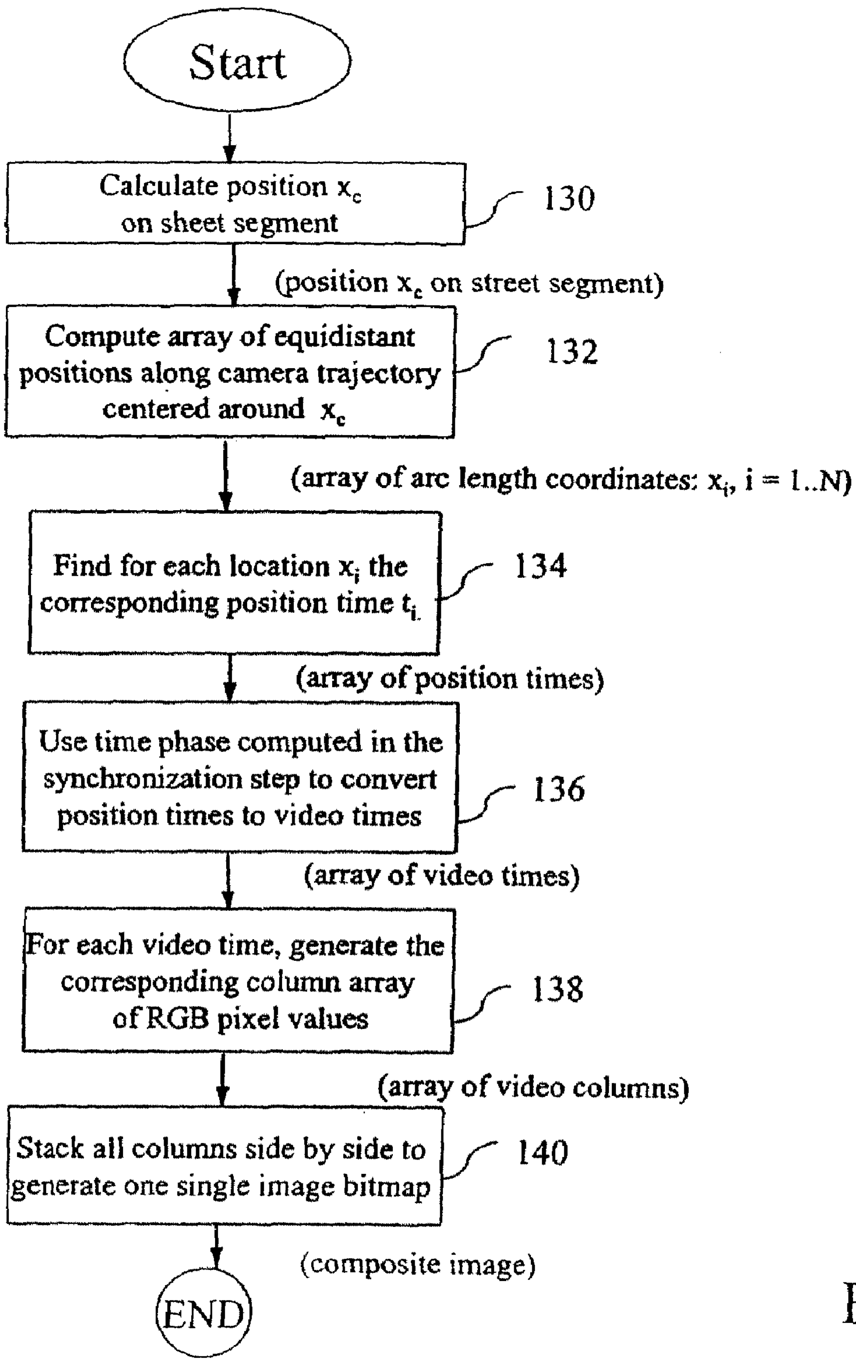

Start
Calculate position x_c on sheet segment
130
(position x_c on street segment)
Compute array of equidistant positions along camera trajectory centered around x_c
132
(array of arc length coordinates: x_i, i = 1..N)
Find for each location x_i the corresponding position time t_i.
134
(array of position times)
Use time phase computed in the synchronization step to convert position times to video times
136
(array of video times)
For each video time, generate the corresponding column array of RGB pixel values
138
(array of video columns)
Stack all columns side by side to generate one single image bitmap
140
(composite image)
END

Fig.10

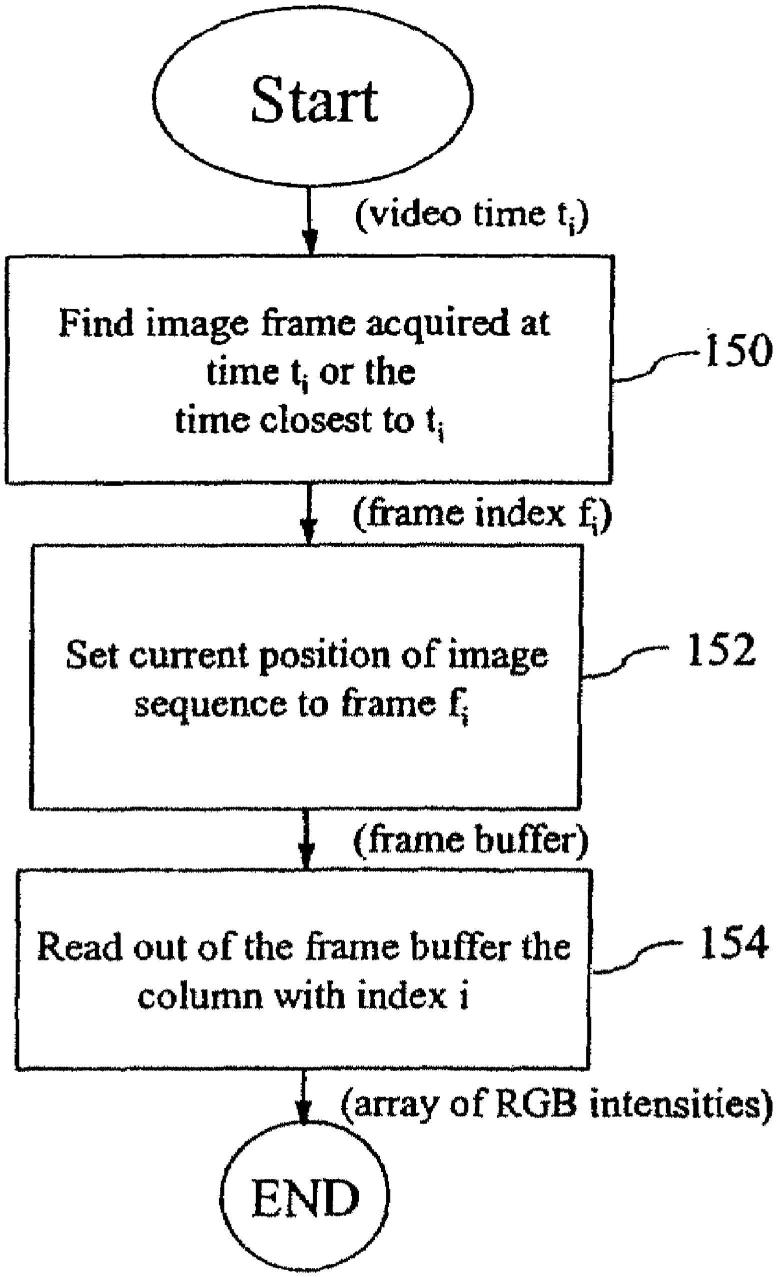

Start
(video time t_i)
Find image frame acquired at time t_i or the time closest to t_i
150
(frame index f_i)
Set current position of image sequence to frame f_i
152
(frame buffer)
Read out of the frame buffer the column with index i
154
(array of RGB intensities)
END

Fig.11

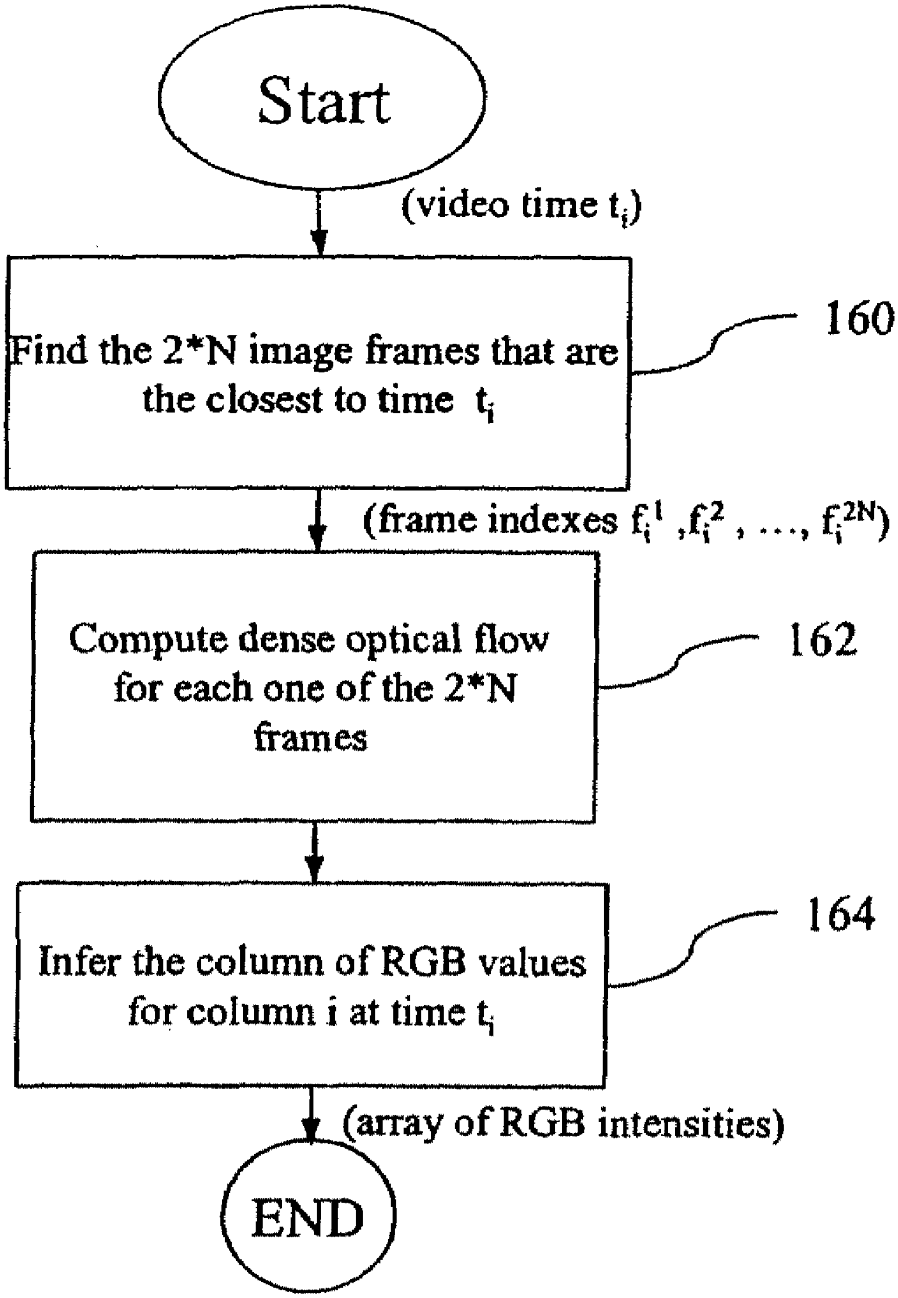

Start
(video time t_i)
Find the 2*N image frames that are the closest to time t_i
160
(frame indexes $f_i^1, f_i^2, \ldots, f_i^{2N}$)
Compute dense optical flow for each one of the 2*N frames
162
Infer the column of RGB values for column i at time t_i
164
(array of RGB intensities)
END

Fig.12

Segment ID (172)	Street Name (174)	Side of Street with Respect to Hub (176)	End Point Coordinates (178)	Segments Adjacent to From Coordinates (180)	Segments Adjacent to To Coordinates (182)	Distance from Hub (184)	Length of Trajectory Segment (186)	Offset (188)
1	Colorado Boulevard	West	(10, 10), (50, 10)	2(N) 4(S) 3(W) 1(E)	5(N) 7(S) 1(W) 6(E)	(120m, 122m)	(28m, 30m)	(2,0)
6	Colorado Boulevard	West	(50, 10) (65,10)	5(N) 7(S) 1(W) 6(E)	8(W) 10(S) 6(W) 9(E)	(130m, 134m)	(20m, 22m)	(0,0)

170

Fig. 13

202 204 206 200

Segment ID	Side Viewed	Distance of Center Position
1	Even	8m
2	Odd	8m
1	Even	16m

Fig. 14

210

Block Label (212)	Segment IDs (214)
(50, 50)	1, 4, 7, 9
(50, 100)	2, 5, 8, 10, 11

Fig. 15

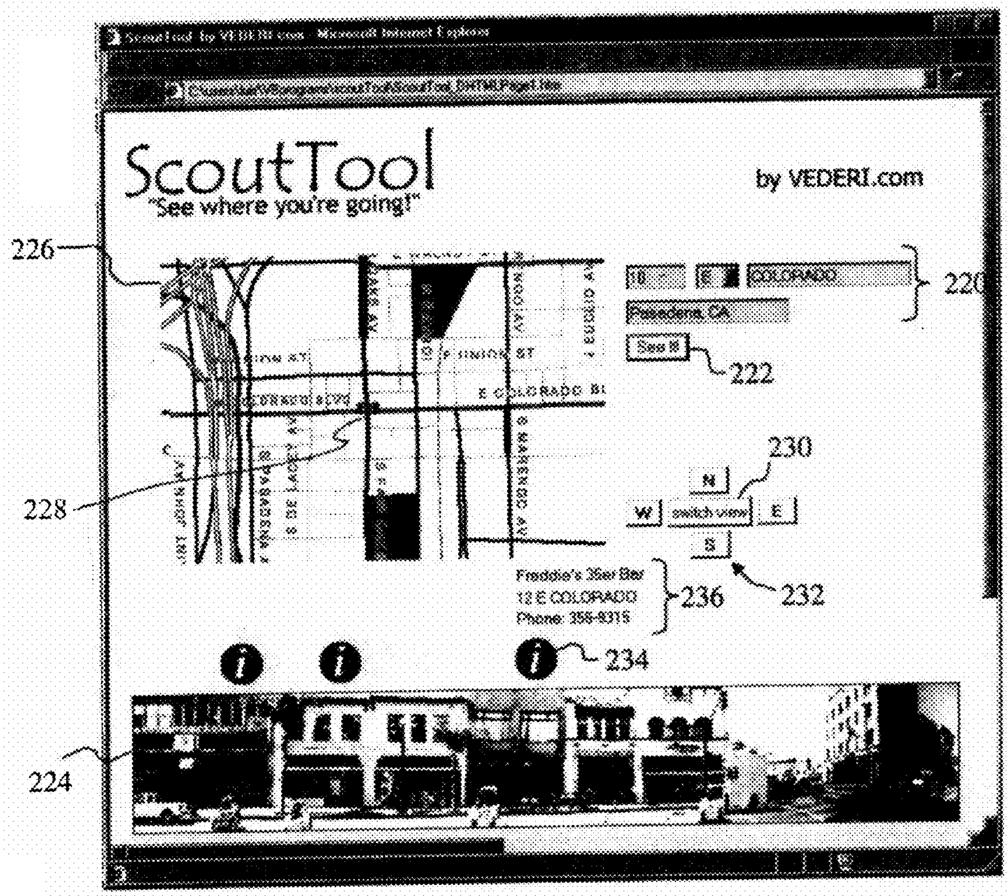

ScoutTool
"See where you're going!"
by VEDERI.com
226
220
222
228
230
W
N
switch view
E
S
232
Freddie's 35er Bar
12 E COLORADO
Phone: 356-9315
236
234
224

Fig.16

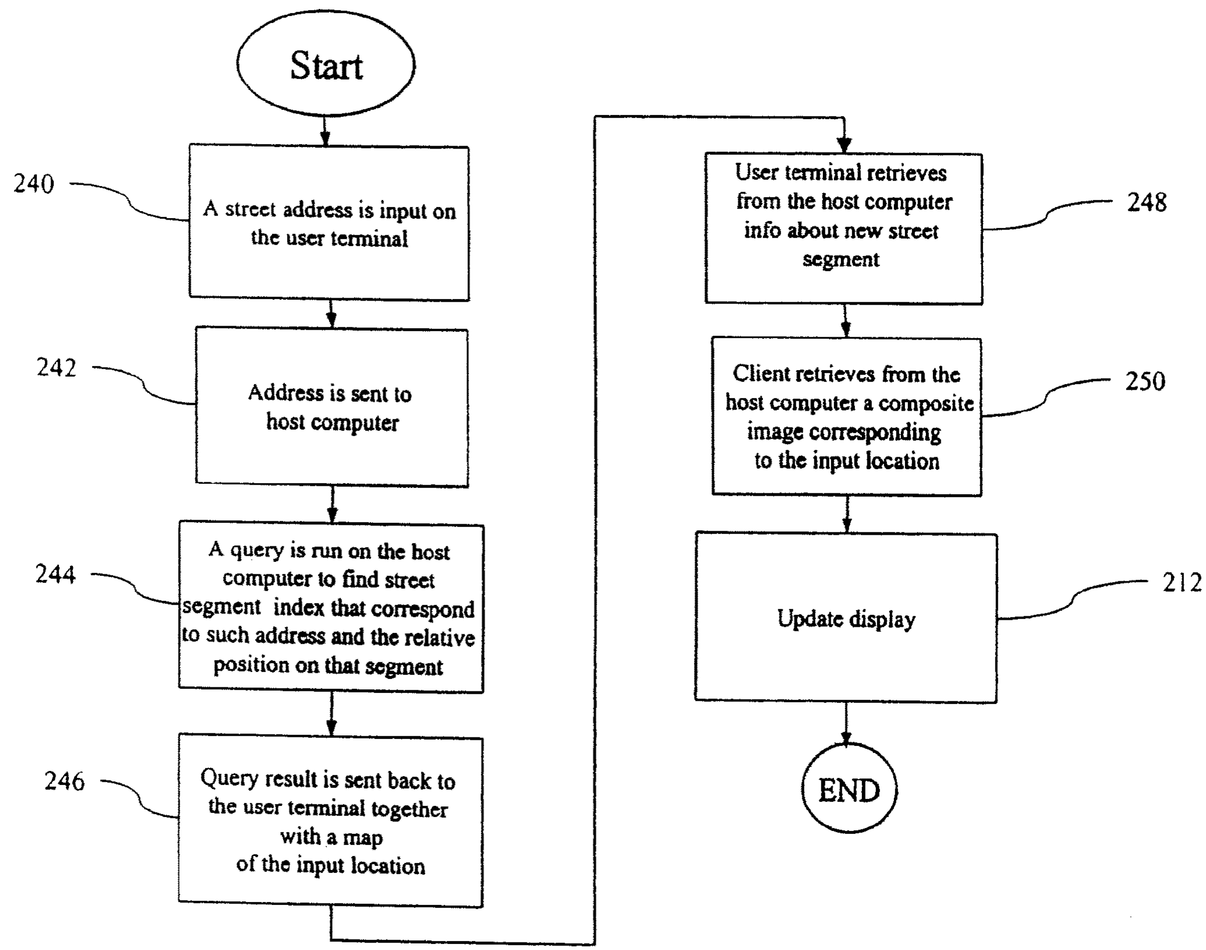

Start
240
A street address is input on the user terminal
242
Address is sent to host computer
244
A query is run on the host computer to find street segment index that correspond to such address and the relative position on that segment
246
Query result is sent back to the user terminal together with a map of the input location
User terminal retrieves from the host computer info about new street segment
248
Client retrieves from the host computer a composite image corresponding to the input location
250
Update display
212
END

Fig.17

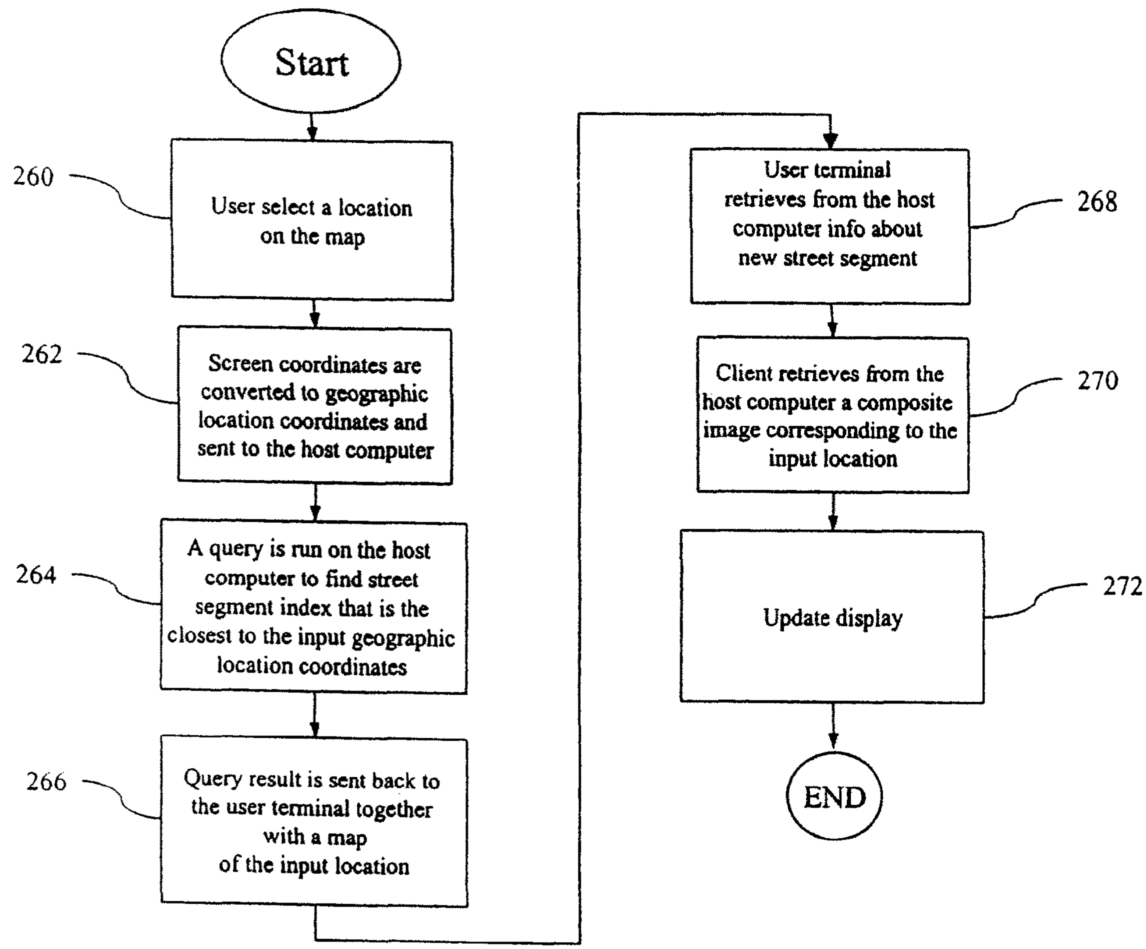

Start
260
User select a location on the map
262
Screen coordinates are converted to geographic location coordinates and sent to the host computer
264
A query is run on the host computer to find street segment index that is the closest to the input geographic location coordinates
266
Query result is sent back to the user terminal together with a map of the input location
User terminal retrieves from the host computer info about new street segment
268
Client retrieves from the host computer a composite image corresponding to the input location
270
Update display
272
END

Fig.18

SYSTEM AND METHOD FOR CREATING, STORING AND UTILIZING IMAGES OF A GEOGRAPHIC LOCATION

CROSS-REFERENCE TO RELATED APPLICATION(S)

This application is a continuation application of U.S. application Ser. No. 11/761,361, filed Jun. 11, 2007 now U.S. Pat. No. 7,577,316, which is a continuation of U.S. application Ser. No. 11/130,004, filed May 16, 2005, now U.S. Pat. No. 7,239,760, issued Jul. 3, 2007, which is a divisional of U.S. application Ser. No. 09/758,717, filed Jan 11, 2001, now U.S. Pat. No. 6,895,126, issued May 17, 2005, which claims the benefit of U.S. provisional patent application No. 60/238,490, filed Oct. 6, 2000, the disclosures of which are hereby incorporated by reference in their entirety for all purposes.

FIELD OF THE INVENTION

This invention relates to visual databases, specifically to the creation and utilization of visual databases of geographic locations.

BACKGROUND OF THE INVENTION

There exist methods in the prior art for creating visual databases of geographic locations. However, such databases are of limited use due to the method of acquiring the imagery as well as the kind of imagery acquired. One particular method involves the taking of individual photographs of the location and electronically pasting the photographs on a polygonal mesh that provide the framework for a three-dimensional (3D) rendering of the location. This method, however, is time consuming and inefficient for creating large, comprehensive databases covering a substantial geographic area such as an entire city, state, or country.

Another method uses video technology to acquire the images. The use of video technology, especially digital video technology, allows the acquisition of the image data at a higher rate, reducing the cost involved in creating the image databases. For example, the prior art teaches the use of a vehicle equipped with a video camera and a Global Positioning System (GPS) to collect image and position data by driving through the location. The video images are later correlated to the GPS data for indexing the imagery. Nevertheless, such a system is still limited in its usefulness due to the lack of additional information on the imagery being depicted.

The nature of the acquired imagery also limits the usefulness of such a system. A single image acquired by the video camera contains a narrow field of view of a locale (e.g. a picture of a single store-front) due to the limited viewing angle of the video camera. This narrow field of view provides little context for the object/scene being viewed. Thus, a user of such an image database may find it difficult to orient himself or herself in the image, get familiar with the locale, and navigate through the database itself.

One way to increase the field of view is to use a shorter focal length for the video camera, but this introduces distortions in the acquired image. Another method is to increase the distance between the camera and the buildings being filmed. However, this may not be possible due to the limit on the width of the road and constructions on the opposite side of the street.

The prior art further teaches the dense sampling of images of an object/scene to provide different views of the object/scene. The sampling is generally done in two dimensions either within a plane, or on the surface of an imaginary sphere surrounding the object/scene. Such a sampling, however, is computationally intensive and hence cumbersome and inefficient in terms of time and cost.

Accordingly, there is a need for a system and method for creating a visual database of a comprehensive geographic area in a more time and cost efficient manner. Such a system should not require the reconstruction of 3D scene geometry nor the dense sampling of the locale in multiple dimensions. Furthermore, the images in the database should provide a wider field of view of a locale to provide context to the objects being depicted. The database should further correlate the images with additional information related to the geographic location and objects in the location to further enhance the viewing experience.

SUMMARY OF THE INVENTION

The present invention addresses and alleviates the above-mentioned deficiencies associated with the prior art. More particularly, the present invention is directed to a computer-implemented system and method for synthesizing images of a geographic location to generate composite images of the location. The geographic location may be a particular street in a geographic area with the composite images providing a view of the objects on each side of the street.

According to one aspect of the invention, an image recording device moves along a path recording images of objects along the path. A GPS receiver and/or inertial navigation system provides position information of the image recording device as the images are being acquired. The image and position information is provided to a computer to associate each image with the position information.

The computer synthesizes image data from the acquired images to create a composite image depicting a view of the objects from a particular location outside of the path. Preferably, the composite image provides a field of view of the location that is wider than the field of view provided by any single image acquired by the image recording device.

In another aspect of the invention, the path of the camera is partitioned into discrete segments. Each segment is preferably associated with multiple composite images where each composite image depicts a portion of the segment. The composite images and association information are then stored in an image database.

In yet another aspect of the invention, the image database contains substantially all of the static objects in the geographic area allowing a user to visually navigate the area from a user terminal. The system and method according to this aspect of the invention identifies a current location in the geographic area, retrieves an image corresponding to the current location, monitors a change of the current location in the geographic area, and retrieves an image corresponding to the changed location. A map of the location may also be displayed to the user along with information about the objects depicted in the image.

DESCRIPTION OF THE DRAWINGS

FIG. **1** is a schematic block diagram of a data acquisition and processing system for acquiring image and position data used to create composite images of a geographic location;

FIG. **2** is an illustration of a composite image created by the data acquisition and processing system of FIG. **1**;

FIG. **3** is a high-level flow diagram of the steps exercised by the data acquisition and processing system of FIG. **1** in creating and storing the composite images;

FIG. **4** is a flow diagram for synchronizing image sequences with position sequences of a recording camera according to one embodiment of the invention;

FIG. **5** is a flow diagram of an alternative embodiment for synchronizing image sequences with position sequences of a recording camera;

FIG. **6** is a block diagram of the data acquisition and processing system of FIG. **1** allowing a real-time synchronization of image and position data;

FIG. **7** is another embodiment for synchronizing image sequences with position sequences of a recording camera;

FIG. **8** is a flow diagram for segmenting and labeling a camera trajectory;

FIG. **9** is an illustration of a trajectory in a single camera scenario;

FIG. **10** is a flow diagram for creating a composite image of a segment of a camera's path;

FIG. **11** is a flow diagram for identifying and retrieving an optical column from an acquired image according to one embodiment of the invention;

FIG. **12** is a flow diagram for identifying and retrieving an optical column from an acquired image according to an alternative embodiment of the invention;

FIG. **13** is an illustration of an exemplary street segments table including street segments in a camera's trajectory;

FIG. **14** is an illustration of an exemplary image coordinates table for associating composite images with the street segments in the street segments table of FIG. **13**;

FIG. **15** is an illustration of an exemplary segment block table for allowing an efficient determination of a segment that is closest to a particular geographic coordinate;

FIG. **16** is an illustration of an exemplary graphical user interface for allowing the user to place requests and receive information about particular geographic locations;

FIG. **17** is a flow diagram of a process for obtaining image and location information of an express street address; and

FIG. **18** is a flow diagram of the process for obtaining image and location information of a location selected from a map.

DETAILED DESCRIPTION OF THE INVENTION

FIG. **1** is a schematic block diagram of a data acquisition and processing system for acquiring and processing image and position data used to create composite images of a geographic location. The composite images are created by synthesizing individual image frames acquired by a video camera moving through the location and filming the objects in its view. The composite images may depict on urban scene including the streets and structures of an entire city, state, or country. The composite images may also depict other locales such as a zoo, national park, or the inside of a museum, allowing a user to visually navigate the locale.

The data acquisition and processing system includes one or more image recording devices preferably taking the form of digital video cameras **10** moving along a trajectory/path and recording images on the trajectory on digital videotapes **12**. Other types of acquisition devices may also be used in combination to, or in lieu of, the digital cameras **10**, such as analog cameras. Furthermore, the video images may be recorded on optical, magnetic, or silicon video tapes, or on any other known types of storage devices that allow random access of particular image frames and particular video pixels within the image frames.

The data acquisition and processing system further includes a GPS receiver **16** for receiving position information from a set of GPS satellites **18** as the cameras **10** move along

the trajectory. An inertial navigation system **20** including one or more accelerometers and/or gyroscopes also provides position information to the data acquisition and processing system. When the inertial navigation system **20** is used in conjunction with the GPS receiver **16**, a more accurate calculation of the position information may be produced.

In an alternative embodiment, position information is acquired using devices other than the inertial navigation system **20** and/or the GPS receiver **16**, such as via computer-vision-based algorithms that compute positions using video information from the video cameras **10**.

The video cameras **10** provide to a multiplexer **22** a frame number and time information for each image acquired via a communication link **24** preferably taking the form of a LANC™ port. The GPS receiver **16** and inertial navigation system **20** also provide position information to the multiplexer **22** via communication links **26***a*, **26***b*, preferably taking the form of RS-232 ports. The multiplexer **22** in turn transmits the received frame number, time information, and position data to a data acquisition computer **34** via a communication link **30**, which also preferably takes the form of an RS-232 port. The computer **34** stores in a trajectory database **36** the position data from the GPS receiver **16** and/or inertial navigation system **20** along with the frame number and time information from the video cameras **10**. This information is then used by a post-processing system **38** to create the composite images.

The post-processing system **38** preferably includes a post-processing computer **28** in communication with a video player **39**. The computer **28** preferably includes a video acquisition card for acquiring and storing the image sequences as the video player **39** plays the videotapes **12** of the acquired images. The computer **28** includes a processor (not shown) programmed with instructions to take the image and position data and create one or more composite images for storing into an image database **32**. The image database **32** is preferably a relational database that resides in a mass storage device taking the form of a hard disk drive or drive array. The mass storage device may be part of the computer **28** or a separate database server in communication with the computer.

In an alternative embodiment, the images are transferred directly to the data acquisition computer **34** as the images are being recorded. In this scenario, the computer **34** is preferably equipped with the video acquisition card and includes sufficient storage space for storing the acquired images. In this embodiment, the data acquisition computer **34** preferably contains program instructions to create the composite images from the acquired images.

In general terms, a composite image of a particular geographic location is created by using at least one video camera **10** recording a series of video images of the location while moving along a path. In the one camera scenario, the camera **10** is moved twice on the same path but in opposite directions to film the objects on both sides of the path. Movement to the camera **10** is provided by a base, platform, or motor vehicle moving at an average speed of preferably about 20 miles/hour to ensure a sufficient resolution in the resulting images. Video cameras with higher sampler rates may allow for faster acquisition speeds.

Preferably, the data acquisition and processing system uses four cameras **10** mounted on top of a moving motor vehicle. Two side cameras face each side of the path for filming objects viewed from the each side of the vehicle. A front and back cameras allow the filming of the objects viewed from the front and back of the vehicle. The front and back cameras may be equipped with fish-eye lens for providing a wide-angle

view of the path. A person skilled in the art should recognize, however, that additional cameras may be used to film the objects from different viewing directions. For example, a duodecahedron of cameras may be used to record the objects from all viewing directions. Furthermore, the side cameras need not face directly to the side of the street, but may face a slightly forward or backward direction to provide a look up or down of the path.

As the images acquired by the cameras **10** are recorded on the videotapes **12**, the frame number and time associated with the images are transferred to the data acquisition computer **34**. The images recorded on the videotapes **12** are later transferred to the post-processing computer **28** for further processing. Once the images are received, the computer **28** stores the image data in its memory in its original form or as a compressed file using one of various well-known compression schemes, such as MPEG.

As the camera **10** moves along the path and records the objects in its view, the GPS receiver **16** computes latitude and longitude coordinates using the information received from the set of GPS satellites **18** at selected time intervals (e.g. one sample every two seconds). The latitude and longitude coordinates indicate the position of the camera **10** during the recording of a particular image frame. The GPS satellite **18** also transmits to the GPS receiver **16** a Universal Time Coordinate (UTC) time of when the coordinates were acquired. The GPS receiver **16** is preferably located on the vehicle transporting the camera **10** or on the camera itself. The GPS data with the position sequences and UTC time information is then transferred to the computer **34** for storing in the trajectory database **36**.

In addition to the position information provided by the GPS receiver **16**, the inertial navigation system **20** also provides acceleration information to the computer **34** for independently deriving the position sequence of the camera **10**. Specifically, the one or more accelerators and gyroscopes in the inertial navigation system **20** monitor the linear and rotational acceleration rates of the camera **10** and transfer the acceleration data to the computer **34**. The computer **34** integrates the acceleration data to obtain the position of the camera **10** as a function of time. The computer **34** preferably combines the position derived from the acceleration information with the GPS position data to produce a more accurate evaluation of the position of the camera **10** at particular instances in time.

The post-processing computer **28** uses the image and position sequences to synthesize the acquired images and create composite images of the location that was filmed. The composite images preferably provide a wider field of view of the location than any single image frame acquired by the camera **10**. In essence, the composite images help provide a panoramic view of the location.

FIG. **2** is an illustration of a composite image **40** created from the image frames **42** acquired by the camera **10** while moving along an x-axis **58** direction. In creating the composite image **40**, the computer assumes a fictitious camera **44** located behind the actual camera **10** and identifies optical rays **46** originating from the fictitious camera. The location of the fictitious camera **44** depends on the desired field of view of the location being filmed. The further away the fictitious camera is placed from the objects along the x-axis **58**, the wider its field of view of the objects.

The computer also identifies optical rays **48** originating from the actual camera **10**. For each optical ray **46** from the fictitious camera **44**, the computer **28** selects an acquired image frame **42** that includes a corresponding optical ray **48** originating from the actual camera **10**. Image data from each selected image frame **42** is then extracted and combined to form the composite image. Preferably, the image data extracted from each image frame is an optical column that consists of a vertical set of pixels. The composite image is preferably created on a column-by-column basis by extracting the corresponding optical column from each image frame. Thus, to create a column Pi **50** in the composite image **40**, the computer locates an image frame **42*a*** that was acquired when the camera **10** was located at Xi **52**. To locate this image frame **42*a***, the computer uses the GPS data and/or data from the inertial navigation system **20** to identify a time Ti **54** at which the camera **10** was in the location Xi **52**. Once the image frame **42*a*** is identified, the computer **28** extracts the optical column **56** with an index (Pi/N)*M, where N is the total number of columns in the composite image **40** and M is the number of columns in the image frame **42*a***. The composite image **40** is stored in the image database **32**, preferably in JPEG format, and associated with an identifier identifying the particular geographic location depicted in the image. Furthermore, close-ups and fish-eye views of the objects are also extracted from the video sequences using well-known methods, and stored in the image database **32**. The unused data from the acquired images is then preferably deleted from the computer's memory.

FIG. **3** is a high-level flow diagram of the steps exercised by the data acquisition and processing system in creating and storing the composite images. In step **60**, the camera **10** acquires a series of images of a particular geographic location. At the same time, the GPS receiver **16** and/or inertial navigation system **20** acquires the position of the camera **10** while the images are being acquired. Because the time associated with the position information (position time) is likely to differ from the times of acquisition of the video images (video time), the computer **28**, in step **62**, synchronizes the image sequence with the position sequence. The synchronization is preferably a post-processing step that occurs after the image and position sequences have been acquired.

In step **64**, the computer **28** segments the trajectory taken by the recording camera **10** into multiple segments and labels each segment with identifying information about the segment. For example, if the camera traverses through various streets, the computer **28** segments the trajectory into multiple straight street segments and associates each street segment with a street name and number range. In step **66**, the computer **28** generates a series of composite images depicting a portion of each segment, and in step **68**, stores each composite image in the image database **32** along with the identifying information of the segment with which it is associated.

FIG. **4** is a more detailed flow diagram of step **62** for synchronizing the image sequences with the position sequences of the recording camera according to one embodiment of the invention. Although the process illustrated in FIG. **4** assumes that the position data is GPS data, a person skilled in the art should recognize that a similar process may be employed to synchronize the images to positions calculated using the inertial navigation system **20**.

The process starts, and in step **70**, a user of the system selects a landmark in the image sequence that appears in at least two distinct video frames. This indicates that the landmark was recorded once while the camera **10** was moving on one direction on the path, and again while the camera was moving in an opposite direction on the same path. The landmark may be, for example, a tree in a lane divider.

In step **72**, a time interval T is measured in the image sequence between the two passings of the landmark. In step **74**, the computer **28** uses the GPS data to compute a function for determining the time interval between successive passes of any point along the path. The function is then used to find,

for each point x on the path, a time of return Tr(x) which measures the lapse of time between the two passings of each point. In step **76**, a point is identified for which Tr(x)=T. The identified point provides the GPS position of the landmark and hence, a GPS time associated with the landmark. Given the GPS time, a difference between the GPS time and the video time associated with the landmark may be calculated for synchronizing any image frame acquired at a particular video time to the GPS position of the camera at a particular GPS time.

FIG. **5** is a flow diagram of an alternative embodiment for synchronizing the image sequences with GPS position information. As in FIG. **4**, the process illustrated in FIG. **5** also identifies, in step **80**, a landmark in the image sequence that appears in at least two distinct image frames. In step **82**, a time phase is initialized to an arbitrary value using the camera time stamp. In step **84**, the computer **28** measures the distance traveled between the two points on the path that correspond to the time instants in the image sequence where the landmark is seen from the two sides of the path. In step **86**, an inquiry is made as to whether the distance has been minimized. If the answer is NO, the time phase is modified in step **88**, and the process returns to step **84** where the distance is measured again.

In another embodiment, the synchronization does not occur as a post-production process, but occurs in real-time as the image and position sequences are acquired. FIG. **6** is a block diagram of a portion of the data acquisition and processing system of FIG. **1** allowing a real-time synchronization of image and position data. A UTC clock generator **90** provides to the data acquisition computer **34** the UTC time associated with each GPS position of the recording camera **10** as the camera moves along the path. The video time produced by a camera clock **92** is also provided to the data acquisition computer **34** via the communications port **24**. A UTC card **94** on the computer **34** correlates the video time to the UTC time. Thus, the video image acquired at the video time may be correlated to the GPS position of the camera during the recording of the image.

FIG. **7** is yet another embodiment for synchronizing the image sequences with the GPS position of the recording camera **10**. In step **100**, the post-processing computer **28** computes the temporal variation in the image values (i.e. optical flow) of the bottom pixel rows in the image sequence. Thus, the average velocity of each of the pixels in the row may be obtained. In step **102**, the tangential velocity of the camera **10** is obtained from the GPS reading. The average velocity for the computed pixels is directly proportional to the vehicle tangential velocity. Thus, in step **104**, the time phase between the position and video sequences may be determined as a time delay maximizing the alignment of local maxima and local minima between the average pixel velocity and the vehicle tangential velocity. This time phase is then read out in step **106**.

FIG. **8** is a more detailed flow diagram of step **64** of FIG. **3** for segmenting the trajectory followed by one or more recording cameras **10** and labeling the segments with an identifier. In the one camera scenario, the camera is moved along the path making a right turn at each intersection until a block **112** has been filmed, as is illustrated in FIG. **9**. The camera then moves to a second block **114** to film the objects on that block. Thus, a particular path **110** adjoining the two blocks **112**, **114** is traversed twice on opposite directions allowing the filming of the objects on each side of the path.

In step **120**, the post-processing computer **28** segments the camera's trajectory into straight segments by detecting the points of maximum curvature (i.e. where the turns occur). In this regard, the latitude and longitude coordinates provided by the GPS receiver **16** are converted into two-dimensional Mercator coordinates according to well-known methods. A spline interpolation is then obtained from the two-dimensional Mercator coordinates and the resulting spline function is parameterized in arc-length. The computer **28** obtains a new sampling of the coordinates from the spline function by uniformly sampling the coordinates in an arc-length increment of about one meter while detecting the points in the new sequence where a turn was made. The place where a turn occurs is assumed to be the place of an intersection of two segments.

Preferably, the computer **28** performs a singular value decomposition computation according to well-known methods to detect the turns. In this regard, the computer selects an observation window containing N sample points that is moved along the spline for calculating an index indicative of the overall direction (i.e. alignment) of the points in the window. The higher the index, the less aligned the points, and the more likely that the camera was making a turn at those points. The points are least aligned at the center of a turn, and thus, the computer selects as a turn coordinate a point in the observation window where the index is at a local maximum. The computer **28** gathers all the points whose indexes correspond to local maxima and stores them into an array of turn coordinates.

In step **122**, the computer **28** determines the center of an intersection by grouping the turn coordinates into clusters where turns that belong to the same cluster are turns made on the same intersection. An average of the turn coordinates belonging to the same cluster is then calculated and assigned as the intersection coordinate.

The endpoints of each straight segment are identified based on the calculated intersection coordinates. In this regard, an intersection coordinate at the start of the segment is identified and assigned to the segment as a segment start point (the “From” intersection coordinate). An intersection coordinate at the end of the segment is also identified and assigned to the segment as a segment end point (the “To” intersection coordinate).

In the scenario where at least two side cameras are utilized, each camera films the objects on each side of the path during the first pass on the path. Thus, unlike the single camera scenario where a turn is made at each intersection to move the camera along the same path twice but in opposite directions, a turn is not made at each intersection in the two camera scenario. Therefore, instead of identifying the points of maximum curvature for determining the intersection coordinates, the intersection coordinates are simply detected by tracking the GPS data and identifying where the segments orthogonally intersect.

The computer **28** associates the calculated segments with information obtained from a geographic information database **128** and stores it into a segments table as is described in further detail below. In the scenario where composite images of a city are created, the geographic information database **128** includes a map of the city where the endpoints of each street segment on the map are identified by latitude and longitude information. The database **128** further includes a street name and number range for each street segment on the map. Such databases are commercially available from third parties such as Navigation Technologies and Etak, Inc.

In correlating the segments of the camera's trajectory with the segments in the geographic information database **128**, the computer, in step **124**, determines the correspondences between the “From” and “To” coordinates calculated for the trajectory segment with intersection coordinates of the seg-

ments in the database. The computer **28** selects the segment in the geographic information database **128** which endpoints are closest to the computed "From" and "To" coordinates, as the corresponding segment.

In step **126**, the computer labels each trajectory segment with information that is associated with the corresponding segment in the database **128**. Thus, if each segment in the database **128** includes a street name and number, this information is also associated with the trajectory segment.

FIG. **10** is a more detailed flow diagram of step **66** of FIG. **3** for creating a composite image of a segment of the camera's path according to one embodiment of the invention. In step **130**, the computer **28** computes the arc length coordinate Xc of the center of the segment which is then set as the center of the composite image. In step **132**, the computer identifies the optical rays **46** (FIG. **2**) originating from the fictitious camera **44** by computing an array of equidistant positions X**1**, X**2**, . . . , Xn along the camera's trajectory, centered around Xc. The number of computed positions preferably depend on the number of optical columns that are to be created in the composite image.

In step **134**, the computer **28** uses the position information obtained from the GPS receiver **16** and/or inertial navigation system **20** to map each position Xi on the trajectory to a position time Ti. Thus, if GPS data is used to determine the camera's position, each position Xi of the camera **10** is mapped to a UTC time.

In step **136**, the computer **28** uses the time phase information computed in the synchronization step **62** of FIG. **3** to convert the position times to video times. For each identified video time, the computer **28**, in step **138**, identifies an associated image frame and extracts a column of RGB pixel values from the frame corresponding to the optical rays **46** originating from the fictitious camera **44**. In step **140**, the column of RGB pixel values are stacked side by side to generate a single image bitmap forming the composite image.

FIG. **11** is a more detailed flow diagram of step **138** for identifying and retrieving a column of RGB pixel values for a particular video time Ti according to one embodiment of the invention. In step **150**, the computer **28** identifies an image frame with frame index Fi acquired at time Ti. Because the image frames are acquired at a particular frame rate (e.g. one frame every 1/30 seconds), there may be a particular time Ti for which an image frame was not acquired. In this scenario, the frame closest to time Ti is identified according to one embodiment of the invention.

In step **152**, the current position of the image sequence is set to the image frame with index Fi, and the frame is placed into a frame buffer. In step **154**, a column in the image frame with an index i is read out from the frame buffer.

FIG. **12** is a flow diagram of an alternative embodiment for identifying and retrieving a column of RGB pixel values for a particular video time Ti. If an image frame was not acquired at exactly time Ti, the computer, in step **160**, identifies 2*N image frames that are closest to time Ti, where N>1. Thus, at least two image frames closest to time Ti are identified. In step **162**, the computer computes an optical flow field for each of the 2*N image frames and in step **164**, infers the column of RGB values for a column i at time Ti. In the situation where only two image frames are used to compute the optical flow, the computer identifies for each pixel in the first image frame a position X**1** and a position time T**1**. A corresponding pixel in the second frame is also identified along with a position X**2** and a position time T**2**. The position X' of each pixel at time Ti is then computed where X'=X**1**+((Ti−T**1**)/(T**2**−T**1**))*(X**2**−X**1**). Given the position of each pixel at time Ti, a new frame that corresponds to time Ti may be inferred. The computer **28** may then extract the column of RGB values from the new frame for a column i.

Preferably, the computer **28** creates multiple composite images at uniform increments (e.g. every 8 meters) along a segment. In the scenario where the composite images are created for street segments, the composite images depict the view of the objects on each side of the street. The composite images are then stored in the image database **28** along with various tables that help organize and associate the composite images with street segment information.

According to one embodiment of the invention, the image database **32** includes composite images of a geographic area which together provide a visual representation of at least the static objects in the entire area. Thus, if the geographic area is a particular city, the composite images depict the city on a street-by-street basis, providing a visual image of the buildings, stores, apartments, parks, and other objects on the streets. The system further includes an object information database with information about the objects being depicted in the composite images. If the geographic area being depicted is a city, the object information database contains information about the structures and businesses on each city street. In this scenario, each record in the object information database is preferably indexed by a city address.

FIG. **13** is an illustration of an exemplary street segments table **170** including the street segments in the camera's trajectory. The table **170** suitably includes multiple entries where each entry is a record specific to a particular street segment. A particular street segment record includes an index identifying the street segment (segment ID) **172** as well as the corresponding street name **174** obtained from the geographic information database **128** (FIG. **12**). A particular street segment record also includes the direction of the street (North, South, East, or West) **176** with respect to a main city street referred to as a city hub. The direction information generally appears in an address in front of the street name. A city, state, and/or country fields may also be added to the table **170** depending on the extent of the geographic area covered in the image database **32**.

A street segment record includes the endpoint coordinates **178** of the corresponding street segment in the geographic information database **128**. An array of segment IDs corresponding to street segments adjacent to the segment start point are identified and stored in field **180** along with the direction in which they lie with respect to the start point (e.g. North, South, East, or West). Similarly, an array of segment IDs corresponding to street segments adjacent to the segment end point are also identified and stored in field **182**. These segments are also ordered along the direction in which they lie.

In addition to the above, a street segment record includes a distance of the start of the trajectory segment from the city hub **184**. The city hub generally marks the origin of the streets from which street numbers and street directions (North, South, East, or West) are determined. Street numbers are generally increased by two at uniform distances (e.g. every 12.5 feet) starting from the hub. Thus the distance from the hub allows a computation of the street numbers on the street segment. In a one camera situation where each segment is traversed twice, the distance from the hub is computed for each camera trajectory. In a multiple camera scenario, however, only one distance is computed since the camera traverses the segment only once.

Also included in a street segment record is a length of the trajectory segment. Such a length is computed for each tra-

jectory in a one camera **10** scenario because the movement of the camera **10** is not identical during the two traversals of the segment.

Each street segment record **170** further includes an offset value **188** for each side of the street. The offset is used to correct the street numberings computed based on the distance information. Such a computation may not be accurate if, for instance, there is an unusually wide structure on the segment that is erroneously assigned multiple street numbers because it overlaps into the area of the next number assignment. In this case, the offset is used to decrease the street numbers on the segment by the offset value.

FIG. **14** is an illustration of an exemplary image coordinates table **200** for associating the composite images with the street segments in the street segments table **170**. The image coordinates table **200** includes a plurality of composite image records where each record includes a segment ID **202** of the street segment being depicted in the composite image. In addition, each composite image record includes information of the side of the street segment **204** being depicted. For example, the side may be described as even or odd based on the street numbers on the side of the street being depicted. Each composite image entry also includes a distance from the segment origin to the center Xc of the composite image **206** indicating the position along the street segment for which the image was computed. The distance information is used to retrieve an appropriate composite image for each position on the street segment.

FIG. **15** is an illustration of an exemplary segment block table **210** for allowing an efficient determination of a segment ID that is closest to a particular geographic coordinate. In this regard, the geographic area depicted in the image database **32** is preferably partitioned into a grid of square blocks where each block includes a certain number of street segments. The blocks are assigned block labels preferably corresponding to the center longitude and latitude coordinates of the block. The block labels are stored in a block label field **212**. Associated with each block label are segment IDs **214** corresponding to the street segments in the block. Given the coordinates of a particular geographic location, the block closest to the given coordinates may be identified to limit the search of street segments to only street segments within the block.

In a particular use of the system, a user places inquiries about a location in a geographic area depicted in the image database **32**. For example, the user may enter an address of the location, enter the geographic coordinates of the location, select the location on a map of the geographic area, or specify a displacement from a current location. Preferably, the user has access to a remote terminal that communicates with a host computer to service the user requests. The host computer includes a processor programmed with instructions to access the image database **32** in response to a user request and retrieve composite images about the particular location. The processor is also programmed with instructions to access the geographic and object information databases to retrieve maps and information on the businesses in the geographic area. The retrieved data is then transmitted to the requesting remote user terminal for display thereon.

The remote user terminals may include personal computers, set-top boxes, portable communication devices such as personal digital assistants, and the like. The visual component of each remote user terminal preferably includes a VGA or SVGA liquid-crystal-display (LC) screen, an LED display screen, or any other suitable display apparatus. Pressure sensitive (touch screen) technology may be incorporated into the display screen so that the user may interact with the remote user terminal by merely touching certain portions of the

screen. Alternatively, a keyboard, keypad, joystick, mouse, and/or remote control unit is provided to define the user terminal's input apparatus.

Each remote user terminal includes a network interface for communicating with the host computer via wired or wireless media. Preferably, the communication between the remote user terminals and the host computer occurs over a wide area network such as the Internet.

In an alternative embodiment of the invention, the image, geographic information, and object information databases reside locally at the user terminals in a CD, DVD, hard disk drive, or any other type of mass storage media. In this embodiment, the user terminals include a processor programmed with instructions to receive queries from the user about a particular geographic location and retrieve composite images and associated information in response to the user queries.

FIG. **16** is an illustration of an exemplary graphical user interface (GUI) for allowing the user to place requests and receive information about particular geographic locations. The GUI includes address input fields **220** allowing the user to enter the street number, street name, city and state of the particular location he or she desires to view. Actuation of a "See It" button **222** causes the user terminal to transmit the address to the host computer to search the image and geographic location databases **32**, **128** for the composite image and map corresponding to the address. Furthermore, the host computer searches the object information database to retrieve information about the objects depicted in the composite image.

The retrieved composite image and map are respectively displayed on the display screen of the requesting user terminal in a map area **226** and an image area **224**. The map is preferably centered around the requested address and includes a current location cursor **228** placed on a position corresponding to the address. The current location identifier **228** may, for instance, take the shape of an automobile.

The composite image displayed on the image area **224** provides a view of a side of the street (even or odd) based on the entered street number. The user may obtain information about the objects being visualized in the composite image by actuating one of the information icons **234** above the image of a particular object. In displaying the information icons **234**, a range of street addresses for the currently displayed image is computed. The listings in the object information database with street numbers that fall inside the computed range are then selected and associated with the information icons **234** displayed on top of the image of the object.

If the objects are business establishments, the information displayed upon actuating the information icons **234** may include the name, address, and phone number **236** of the establishment. This information is preferably displayed each time the user terminal's cursor or pointing device is passed above the icon. In addition, if the establishment is associated with a particular Web page, the information icon **234** functions as a hyperlink for retrieving and displaying the Web page, preferably on a separate browser window.

The user may obtain a close-up view of a particular object in the composite image by selecting the object in the image. A close-up view of the object is then obtained by computing the distance of the selected object from the origin of the street segment where they object lies. The location on the segment of the closest close-up image is computed and retrieved from the image database **32**. The close-up image is then provided in the image area **224** or in a separate browser window.

A "Switch View" button **230** allows the user to update the current composite image providing a view of one side of the street with a composite image of the other side of the street. In

a multiple camera scenario, each actuation of the "Switch View" button **230** provides a different view of the street. The current view is preferably identified by a direction identifier (not shown) on or close to the current location identifier **228**. For instance, one side of the current location identifier **228** may be marked with a dot or an "X" to identify the side of the street being viewed. Alternatively, an arrow may be placed near the current location identifier **228** to identify the current viewing direction.

The composite image is also updated as the user navigates through the streets using the navigation buttons **232**. From a current location, the user may choose to navigate north, south, west, and east by actuating the corresponding buttons. Preferably, only the navigation buttons corresponding to the possible direction of motions from the current position are enabled. As the user actuates one of the buttons, the current position is incremented by a predetermined amount, currently set to eight meters, to the next available composite image on the current or adjacent segment. The image area **224** is then updated with the new composite image.

FIG. **17** is a flow diagram of the process executed by the host computer for obtaining image and location information of an express street address entered in the address input fields **220**. A similar process is executed by the user terminal in the embodiment where the location and image information are stored locally at the user terminal.

The process starts, and in step **240**, the user requests information about a particular street address by entering the address in the address input fields **220**. In step **242**, the address is transmitted to the host computer preferably over a wide area network such as the Internet. In step **244**, a query is run on the host computer to locate the street segment index in the street segment table **170** (FIG. **13**) corresponding to the requested address. In this regard, the computer searches the street segment table **170** for street segments that match the desired street name **174** as well as a city, state, or country if applicable. For each street segment matching the street name, the computer computes the starting street number on that segment preferably based on the following formula:

$$\text{Start Number}=(\text{round}((\text{Distance from Hub}+\text{Offset})/K)*2)$$

The distance from the hub **184** and offset **188** values are obtained from the street segment table **170**. The value K is the distance assumed between any two street numbers on the segment.

The ending street number on the street segment is also calculated using a similar formula:

$$\text{End Number}=(\text{round}((\text{Distance from Hub}+\text{Offset}+\text{length})/K)*2)$$

The length is the length **186** value obtained from the street segment table **170**.

Once the start and end street numbers are calculated for a particular street segment, the computer determines whether the requested street number lies within the start and end street numbers. If it does, the computer returns the corresponding segment ID **172**. Furthermore, the computer determines the distance of the requested street number from the start of the street segment for determining the position of the street number on the street segment.

In step **246**, the host computer transmits the query result to the requesting user terminal along with a map of the input location retrieved from the geographic information database **128**. In step **248**, the requesting user terminal downloads from the host computer a record from the street segments table **170** corresponding to the identified street segment. Furthermore, the user terminal also retrieves the computed start and end street numbers of the street segment, a list of computed composite images for both sides of the street segment in the image coordinates table **200** (FIG. **14**), and information of the objects visible on the street segment in the object information database.

In step **250**, the user terminal downloads a composite image for the appropriate side of the street from the host computer that has a distance from the origin of the street segment to the center of the composite image **206** (FIG. **14**) that is closest to the distance of the desired street number from the origin. The display on the user terminal is then updated in step **252** with the new location and image information.

FIG. **18** is a flow diagram of the process executed by the host computer for obtaining image and location information of a particular location selected on the map displayed in the map area **226**. A similar process is executed by the user terminal in the embodiment where the location and image information are stored locally at the user terminal.

The process starts, and in step **260**, the user requests information about a particular street address by selecting a location on the map. In step **262**, the map coordinates are converted from screen coordinates to geographic location coordinates (x,y) and transmitted to the host computer preferably over the Internet. In step **244**, a query is run on the host computer to locate the street segment index in the street segment table **170** (FIG. **13**) corresponding to the geographic location coordinates. In this regard, the computer searches the segment block table **210** (FIG. **15**) for a block that includes the street segment corresponding to the input location. In order to locate such a block, the computer rounds the identified geographic location coordinates based preferably on the size of the block. The rounded (x,y) coordinates may thus be represented by ((round (x/B))*B, (round y/B)*B)), where B is the length of one of the block sides. The computer then compares the rounded number to the coordinates stored in the block label field **212** and selects the block with the label field **212** equal to the rounded coordinate. Once the appropriate block is identified, the computer proceeds to retrieve the segment IDs **214** associated with the block. The geographic coordinates of the desired location are then compared with the endpoint coordinates of each street segment in the block for selecting the closest street segment.

In step **266**, the segment ID of the closest street segment is returned to the user terminal. Additionally, a new map of the desired location may be transmitted if the previous map was not centered on the desired location.

In step **268**, the requesting user terminal downloads from the host computer a street segment record in the street segments table **170** corresponding to the identified street segment. The user terminal also retrieves the calculated start and end street numbers of the street segment, a list of computed composite images for both sides of the street the segment in the image coordinates table **200** (FIG. **14**), and information of the objects visible on the street segment in the object information database.

In step **270**, the user terminal downloads the composite image corresponding to the geographic coordinates of the input location. To achieve this, the geographic coordinates are converted to a distance along the identified street segment. The user terminal downloads a composite image that has a distance from the origin of the street segment to the center of the composite image **206** (FIG. **14**) that is closest to the distance of the input location from the origin. The display on the user terminal is then updated in step **272** with the new location and image information.

Although this invention has been described in certain specific embodiments, those skilled in the art will have no difficulty devising variations which in no way depart from the scope and spirit of the present invention. For example, the composite images may be made into streaming video by computing the composite images at small increments along the path (e.g. every 30 cm). Furthermore, the composite images may be computed at several resolutions by moving the fictitious camera **44** (FIG. **2**) closer or further away from the path to decrease or increase its field of view and provide the user with different zoom levels of the image.

Variation may also be made to correct any distortions in the perspective of the composite image along the vertical y-axis direction. The extraction of the optical columns from the acquired image frames may introduce such a distortion since the sampling technique used along the horizontal x-axis direction is not applied along the y-axis. Such a distortion may be corrected by estimating the depth of each pixel in the composite image using optical flow. The aspect ratio of each pixel may be adjusted based on the distance of the object visualized in the pixel. The distortion may also be corrected by acquiring images from an array of two or more video cameras **10** arranged along the vertical y-axis in addition to the cameras in the horizontal axis.

The described method of generating composite images also relies on an assumption that the camera's trajectory is along a straight line. If this is not the case and the vehicle carrying the camera makes a lane change, makes a turn, or passes over a bump, the choice of the optical column extracted from a particular image frame may be incorrect. The distortion due to such deviations from a straight trajectory may, however, be corrected to some degree using optical flow to detect such situations and compensate for their effect.

It is therefore to be understood that this invention may be practiced otherwise than is specifically described. Thus, the present embodiments of the invention should be considered in all respects as illustrative and not restrictive, the scope of the invention to be indicated by the appended claims and their equivalents rather than the foregoing description.

What is claimed is:

1. In a system including an image source and a user terminal having a screen and an input device, a method for enabling visual navigation of a geographic area from the user terminal, the method comprising:

receiving a first user input specifying a first location in the geographic area;

retrieving from the image source a first image associated with the first location, the image source providing a plurality of images depicting views of objects in the geographic area, the views being substantially elevations of the objects in the geographic area, wherein the images are associated with image frames acquired by an image recording device moving along a trajectory;

retrieving a map of at least a portion of the geographic area;

displaying the retrieved first image on a first display area of the screen and the retrieved map on a second display area of the screen;

receiving a user selection of a position on the displayed map;

determining a second location based on the user selected position; and

retrieving from the image source a second image associated with the second location.

2. The method of claim **1** further comprising:

displaying the second image on the first display area of the screen.

3. The method of claim **1**, wherein the first and second images are each a composite image, wherein each composite image is created based on a first one of the image frames acquired at a first point in the trajectory and a second one of the image frames acquired at a second point in the trajectory.

4. The method of claim **1**, wherein the first and second images are each a composite image, wherein each composite image is created by processing pixel data of a plurality of the image frames.

5. The method of claim **1**, wherein the first and second images each depict a wider field of view than is depicted in any one of the image frames.

6. The method of claim **1** further comprising:

acquiring position information associated with the image recording device as the image recording device moves along the trajectory; and

synchronizing the image frames acquired by the image recording device with the position information.

7. The method of claim **6**, wherein the first and second images are associated to respectively the first and second locations, based on the synchronized position information.

8. The method of claim **1** further comprising:

segmenting the trajectory on which the image recording devices moves, into a plurality of segments;

correlating the plurality of segments to a plurality of street segments in a geographic information database;

identifying one of the plurality of street segments based on the first user input specifying the first location; and

retrieving the first image based on the identified one of the plurality of street segments.

9. The method of claim **8**, wherein the correlating the plurality of segments includes correlating position data of the plurality of segments to position data of the plurality of street segments.

10. In a system including an image source and a user terminal having a screen and an input device, a method for enabling visual navigation of a geographic area from the user terminal, the method comprising:

providing by the image source a plurality of images depicting views of objects in the geographic area, the views being substantially elevations of the objects in the geographic area, wherein the images are associated with image frames acquired by an image recording device moving along a trajectory;

receiving by the user terminal a first user input specifying a first location in the geographic area;

retrieving by the user terminal a first image associated with the first location, the first image being one of the plurality of images provided by the image source;

retrieving by the user terminal a map of at least a portion of the geographic area;

displaying by the user terminal the retrieved first image on a first display area of the screen and the retrieved map on a second display area of the screen;

receiving by the user terminal user selection of a second location on the displayed map;

retrieving by the user terminal a second image associated with the second location, the second image being one of the plurality of images provided by the image source; and

displaying by the user terminal the retrieved second image on the first display area of the user terminal.

11. The method of claim **10**, wherein the first and second images are each a composite image, wherein each composite image is created based on a first one of the image frames acquired at a first point in the trajectory and a second one of the image frames acquired at a second point in the trajectory.

12. The method of claim **10**, wherein the first and second images each depict a wider field of view than is depicted in any one of the image frames.

13. The method of claim **10**, wherein the first and second images are each a composite image, wherein each composite image is created by processing pixel data of a plurality of the image frames.

14. The method of claim **10**, wherein the image source is hosted by the user terminal.

15. A method for enabling visual navigation of a geographic area via a computer system coupled to an image source, the computer system including one or more computer devices, at least one of the computer devices having a display screen, the method comprising:

providing by the image source a plurality of images depicting views of objects in the geographic area, the views being substantially elevations of the objects in the geographic area, wherein the images are associated with image frames acquired by an image recording device moving along a trajectory;

receiving by the computer system a first user input specifying a first location in the geographic area;

retrieving by the computer system a first image associated with the first location, the first image being one of the plurality of images provided by the image source;

providing by the computer system the retrieved first image for displaying on a first display area of the display screen;

providing a map of at least a portion of the geographic area for displaying on a second display area of the display screen;

receiving by the computer system a user selection of a position on the map;

determining by the computer system a second location in the geographic area in response to the user selection;

retrieving by the computer system a second image associated with the second location, the second image being one of the plurality of images provided by the image source; and

providing by the computer system the retrieved second image for displaying on the first display area of the display screen.

16. The method of claim **15**, wherein the first location specified by the first user input is an address specifying information selected from the group consisting of street name, city, state, and zip code.

17. The method of claim **15** further comprising:

determining screen coordinates of the selected position;

converting the screen coordinates to geographic location data; and

determining the second location based on the geographic location data.

18. The method of claim **15** further comprising:

receiving by the computer system a second user input specifying a navigation direction relative to the second location in the geographic area; and

updating by the computer system the second image displayed on the first display area in response to the second user input.

19. The method of claim **18** further comprising:

invoking by the computer system a display of a navigation button indicating the navigation direction; and

receiving by the computer system user selection of the navigation button.

20. The method of claim **15** further comprising:

receiving by the computer system a second user selection associated with a particular one of the objects depicted in the first image; and

invoking display of information on the particular one of the objects in response to the second user selection.

21. The method of claim **20**, wherein the particular one of the objects is a retail establishment, the method further comprising:

accessing a web page for the retail establishment; and

invoking by the computer system a display of the web page on the display screen.

22. The method of claim **20** further comprising:

invoking by the computer system a display of an icon in association with the particular one of the objects, wherein the second user selection is actuation of the icon.

23. The method of claim **15** further comprising:

invoking by the computer system a display of a direction identifier for indicating a viewing direction depicted by the first or second image displayed on the first display area.

24. The method of claim **15** further comprising:

invoking by the computer system a display of a location identifier on the map for identifying the first location in the portion of the geographic area.

25. The method of claim **15**, wherein the first and second images each provide a panoramic view of the objects at respectively the first and second locations.

26. The method of claim **15**, wherein the first and second images are each a composite image, wherein each composite image is created based on a first one of the image frames acquired at a first point in the trajectory and a second one of the image frames acquired at a second point in the trajectory.

27. The method of claim **15**, wherein the first and second images are each a composite image, wherein each composite image is created by processing pixel data of a plurality of the image frames.

28. The method of claim **15**, wherein the first and second images each depict a wider field of view than is depicted in any one of the image frames.

29. The method of claim **15** further comprising:

acquiring position information associated with the image recording device as the image recording device moves along the trajectory; and

synchronizing the image frames acquired by the image recording device with the position information.

30. The method of claim **29**, wherein the first and second images are associated to respectively the first and second locations, based on the synchronized position information.

31. The method of claim **15** further comprising:

segmenting the trajectory on which the image recording devices moves, into a plurality of segments;

correlating the plurality of segments to a plurality of street segments in a geographic information database;

identifying one of the plurality of street segments based on the first user input specifying the first location; and

retrieving the first image based on the identified one of the plurality of street segments.

32. The method of claim **31**, wherein the correlating the plurality of segments includes correlating position data of the plurality of segments to position data of the plurality of street segments.

33. The method of claim **15**, wherein the one or more computer devices includes a server.

34. The method of claim **15**, wherein the one or more computer devices includes a user terminal.

35. A user terminal coupled to an image source and a data store for visually navigating a geographic area, the user terminal including:

a display screen;

a processor coupled to the display screen; and

a memory coupled to the processor and storing computer program instructions therein, the processor configured to execute the computer program instructions, the computer program instructions including:

receiving a first user input specifying a first location in the geographic area;

retrieving from the image source a first image associated with the first location, the image source providing a plurality of images depicting views of objects in the geographic area, the views being substantially elevations of the objects in the geographic area, wherein the images are associated with image frames acquired by an image recording device moving along a trajectory;

retrieving from the data store a map of at least a portion of the geographic area;

displaying the retrieved first image on a first display area of the display screen and the retrieved map on a second display area of the display screen;

receiving a user selection of a second location on the displayed map;

retrieving from the image source a second image associated with the second location; and

displaying the retrieved second image on the first display area of the display screen.

36. The user terminal of claim **35**, wherein the first location specified by the first user input is an address specifying information selected from the group consisting of street name, city, state, and zip code.

37. The user terminal of claim **35**, wherein the computer program instructions further include:

determining screen coordinates associated with the selected second location;

converting the screen coordinates to geographic location data; and

determining the second location in the geographic area based on the geographic location data.

38. The user terminal of claim **37**, wherein the computer program instructions further include:

receiving a second user input specifying a navigation direction relative to the second location in the geographic area; and

updating the second image displayed on the first display area in response to the second user input.

39. The user terminal of claim **38**, wherein the computer program instructions further include:

displaying a navigation button indicating the navigation direction; and

receiving user selection of the navigation button.

40. The user terminal of claim **35**, wherein the computer program instructions further include:

receiving a second user selection associated with a particular one of the objects depicted in the first image; and

displaying information on the particular one of the objects in response to the second user selection.

41. The user terminal of claim **40**, wherein the particular one of the objects is a retail establishment, and the computer program instructions further include:

accessing a web page for the retail establishment; and

displaying the web page on the display screen.

42. The user terminal of claim **40**, wherein the computer program instructions further include:

displaying an icon in association with the particular one of the objects, wherein the second user selection is actuation of the icon.

43. The user terminal of claim **35**, wherein the computer program instructions further include:

displaying a direction identifier for indicating a viewing direction depicted by the first or second image displayed on the first display area.

44. The user terminal of claim **35**, wherein the computer program instructions further include:

displaying a location identifier on the map for identifying the first location in the portion of the geographic area.

45. A system for enabling visual navigation of a geographic area, the system comprising:

an image source providing a plurality of images depicting views of objects in the geographic area, the views being substantially elevations of the objects in the geographic area, wherein the images are associated with image frames acquired by an image recording device moving along a trajectory;

a data store storing a map of the geographic area; and

one or more computer devices coupled to the image source and the data store, at least one of the computer devices having a display screen, the one or more computer devices being configured to execute computer program instructions including:

receiving a first user input specifying a first location in the geographic area;

retrieving a first image associated with the first location, the first image being one of the plurality of images provided by the image source;

providing the retrieved first image for displaying on a first display area of the display screen;

providing a map of at least a portion of the geographic area for displaying on a second display area of the display screen;

receiving a user selection of a position on the map;

determining a second location in the geographic area in response to the user selection;

retrieving a second image associated with the second location, the second image being one of the plurality of images provided by the image source; and

providing the retrieved second image for displaying on the first display area of the display screen.

46. The system of claim **45**, wherein the first location specified by the first user input is an address specifying information selected from the group consisting of street name, city, state, and zip code.

47. The system of claim **45**, wherein the computer program instructions further include:

determining screen coordinates of the selected position;

converting the screen coordinates to geographic location data; and

determining the second location based on the geographic location data.

48. The system of claim **45**, wherein the computer program instructions further include:

receiving a second user input specifying a navigation direction relative to the second location in the geographic area; and

updating the second image displayed on the first display area in response to the second user input.

49. The system of claim **48**, wherein the computer program instructions further include:

invoking display of a navigation button indicating the navigation direction; and

receiving user selection of the navigation button.

50. The system of claim **45**, wherein the computer program instructions further include:

receiving a second user selection associated with a particular one of the objects depicted in the first image; and

invoking display of information on the particular one of the objects in response to the second user selection.

51. The system of claim **50**, wherein the particular one of the objects is a retail establishment, the method further comprising:

accessing a web page for the retail establishment; and

invoking display of the web page on the display screen.

52. The system of claim **50**, wherein the computer program instructions further include:

invoking display of an icon in association with the particular one of the objects, wherein the second user selection is actuation of the icon.

53. The system of claim **45**, wherein the computer program instructions further include:

invoking display of a direction identifier for indicating a viewing direction depicted by the first or second image displayed on the first display area.

54. The system of claim **45**, wherein the computer program instructions further include:

invoking display of a location identifier on the map for identifying the first location in the portion of the geographic area.

55. The system of claim **45**, wherein the first and second images each provide a panoramic view of the objects at respectively the first and second locations.

56. The system of claim **45**, wherein the first and second images are each a composite image, wherein each composite image is created based on a first one of the image frames acquired at a first point in the trajectory and a second one of the image frames acquired at a second point in the trajectory.

57. The system of claim **45**, wherein the first and second images are each a composite image, wherein each composite image is created by processing pixel data of a plurality of the image frames.

58. The system of claim **45**, wherein the first and second images each depict a wider field of view than is depicted in any one of the image frames.

59. The system of claim **45**, wherein the computer program instructions further include:

acquiring position information associated with the image recording device as the image recording device moves along the trajectory; and

synchronizing the image frames acquired by the image recording device with the position information.

60. The system of claim **59**, wherein the first and second images are associated to respectively the first and second locations, based on the synchronized position information.

61. The system of claim **45**, wherein the computer program instructions further include:

segmenting the trajectory on which the image recording devices moves, into a plurality of segments;

correlating the plurality of segments to a plurality of street segments in a geographic information database;

identifying one of the plurality of street segments based on the first user input specifying the first location; and

retrieving the first image based on the identified one of the plurality of street segments.

62. The system of claim **61**, wherein the correlating the plurality of segments includes correlating position data of the plurality of segments to position data of the plurality of street segments.

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UNITED STATES PATENT AND TRADEMARK OFFICE

CERTIFICATE OF CORRECTION

PATENT NO. : 7,813,596 B2
APPLICATION NO. : 12/482284
DATED : October 12, 2010
INVENTOR(S) : Luis F. Goncalves et al.

It is certified that error appears in the above-identified patent and that said Letters Patent is hereby corrected as shown below:

On the Title Page

Item (57) Abstract, line 2	Delete "provide" Insert -- provides --

In the Specification

Column 3, line 49	Delete "on" Insert -- an --
Column 4, line 64	Delete "A front" Insert -- Front --
Column 10, line 38	Delete "fields" Insert -- field --

Signed and Sealed this
Fifth Day of August, 2014

Michelle K. Lee

Michelle K. Lee
Deputy Director of the United States Patent and Trademark Office

UNITED STATES COURT OF APPEALS
FOR THE FEDERAL CIRCUIT

CERTIFICATE OF COMPLIANCE WITH TYPE-VOLUME LIMITATIONS

Case Number: 2022-1477, 2022-1478, 2022-1479, 2022-1480

Short Case Caption: Vederi LLC v. Google LLC

Instructions: When computing a word, line, or page count, you may exclude any items listed as exempted under Fed. R. App. P. 5(c), Fed. R. App. P. 21(d), Fed. R. App. P. 27(d)(2), Fed. R. App. P. 32(f), or Fed. Cir. R. 32(b)(2).

The foregoing filing complies with the relevant type-volume limitation of the Federal Rules of Appellate Procedure and Federal Circuit Rules because it meets one of the following:

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Date: 08/01/2022

Signature: /s/ Shaun P. Lee

Name: Shaun P. Lee